NAVY CIVIL ENGINEER

WINTER 1973

- THE TROUBLED AIR
  Page 4
- NAVY FUEL SHORTAGE
  Page 9
- NEW LIFE FOR OLD CRANES
  Page 16

ON THE COVER

Clean coastal waters are a dedicated Navy commitment. Here, Artist Bill Brack portrays a routine task of a U.S. Navy oil skimmer retrieving petroleum waste that could possibly have been accidentally discharged but more than likely is a result of normal seepage. Containment booms are attached to the mouth of the skimmer and guide the waste to the oil recovery vessel for digestion.

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IN THIS ISSUE

AICUZ — DOD's Pacification Program 4
By W. B. Griffiths

"Noisy Goat" Tests at San Clemente 6
By R. D. Lewis

McMurdo Nuclear Power Plant Closed 7
By Cdr. G. E. Krauter, CEC, USN

Nimitz Library Dedicated at Naval Academy 8
By Richard S. Goodwin

Navy's Fuel Crisis/30-day storage 9
By R. A. Fitzgerald, P. E.

NAVFAC Presents Energy Alternatives to AEC..... 9
By H. C. Lamb

CAPSE — Power System Safeguard 10
By D. M. Hannemann, P. E.

Shore Power to the Fleet 11
By John N. Agnos

High-Strength Electromechanical Cable 12
By Patrick Cave

NCEL Becomes Part of NCBC Port Hueneme 12

Portable Paint Identification Kit 12

Construction Management Transitions in Vietnam.....13
By Lyle Jones

Big Yellow Flush Truck 14
By CW02 W. R. Mangrum, CEC, USN

Project Specifications by Computer 15
By Richard H. Welles

Lifting Old Cranes Into Shape 16
By LT W. Samuel Niece, CEC, USN

Trends in Navy Yards and Drydocks 18
By F. T. Kieferle

NAVFAC/UCT-1 Install Underwater Sensor System..18
By Ens. Robert H. Mayer, Jr., CEC, USN

CBC Davisville to Logistics Role Sans Seabees.....18

NAVFAC Pollution Control Standards Adjusted.....19
By Lajos M. Wernigg and George C. White

Updating Sanitary Landfill Criteria 19
By Lajos M. Wernigg

Performance Specification Defined 19
By Richard H. Welles

Naval Construction Force Review 20
By Cdr. D. L. Conner, CEC, USN

Seabee Rates Listed in DPPO Drive 20
By Lt. R. P. Angelelli, CEC, USN

Seabee Retention Study Group Advises CNO 21
By CUCM Omar Welborn

Professional Registration Enhances CEC Officers' Careers 21
By Lt. G. F. Everhart

Real Property Inventory Credibility 22
By R. K. Volk, Jr.

Inadequate Quarters Designations Reinstituted 22
By Norman C. Bearden

Multi-year Program System for Military Construction..23
By Cdr. T. P. Schurr, CEC, USN

PWC San Francisco Debut Slated 23

Building a Nest for Navy's SES 24
By Lt. T. L. Huguelet, CEC, USN

Advice of Counsel — Fulfilling Contract Obligations..26
By NAVFAC Counsel Staff

CECOS Courses Offered, February-July 1974 26

NARF... Big Business in San Diego 28
By Lt. James W. Owen, II, CEC, USN

Index, The Navy Civil Engineer, 1973 30

AICUZ DOD's Pacification

• Alexandria, Va.

The Department of Defense's Air Installation Compatible Use Zone (AICUZ) program has been established to forestall degradation of the operational capabilities of military air installations by promoting development of surrounding lands that is compatible with the noise levels and safety hazards associated with airfield operations. The purpose is not to require that surrounding land remain open space, but to foster uses that are not adversely affected by airfield operations, while providing proper safety, noise and building protection.

The importance of unobstructed and controlled air space in proximity to air installations was recognized at an early date and was one of the prime factors that has influenced the selection of new base sites and the retention and expansion of existing installations over the years. The currently critical problem of community growth and air installation incompatibility arose from overzealous developers and/or inadequate zoning controls. The installations acted as magnets, attracting peripheral growth to accommodate their needs, then attracting additional growth to serve the increasing peripheral population.

The Navy has been receiving the greatest pressure because the majority of its installations are in coastal areas experiencing the greatest population increase with growth rates of 26.3%, exceeding the national metropolitan average of 16.6%.

Aircraft engines have become increasingly more powerful and, only lately, a little less noisy. The technology for aircraft noise control hopefully can be efficiently applied to military engines, although it does not appear too promising for the immediate future. Engine test and runup facilities have not, until recently, received the sound suppression effort necessary for good environmental compatibility. Only recently have sound reduction facilities been built for quieting the noise of engines being tested while on the airplane.

Urban sprawl, especially residential development, is increasing on privately-owned lands abutting air installations. This sprawl was recognized and reported by nearly all Navy air installations in the first Project Guardian reports in 1966. Local communities are becoming more critical of aircraft noise and increasing pressure is being applied by local governments and citizens' groups to restrict flight operations. Mission degradation has often resulted from these pressures.

Three recent developments highlight the need for an AICUZ-type concept:

1. The effects of noise pollution have been emphasized by enactment of the Federal Noise Control Act of 1972.

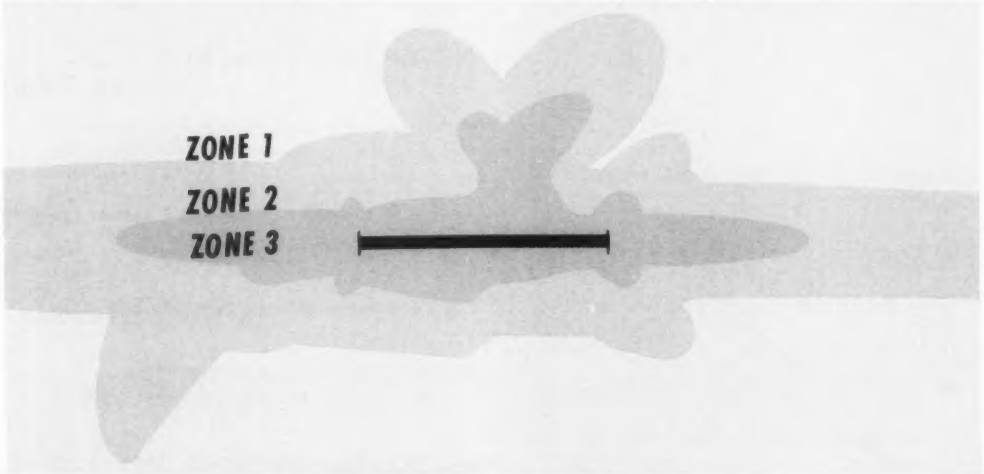
2. The new position of the Department of Transportation, which includes FAA, permitting local governments to reduce night time noise pollution by placing curfews on jet aircraft traffic at local airports gives cities and counties increased dominion over the airspace involved.

3. A California superior court jury award to 49 families living near Los Angeles International Airport for damages by noise may set a precedent and open the door for suits by aggrieved parties throughout the United States.

The objective of the AICUZ program is to attempt to effect uses of non-government land around air installations that are compatible with airfield operations. The goal is to protect the public from the noise and safety hazards associated with aircraft operations, and to protect the operational capability of the installations. Compatible uses, if in the correct location, are light industrial, storage, nonspectator sports and low-density recreation, besides the obvious maintenance of open space and agriculture.

Some agricultural activities, such as raising certain grain crops or pasturing animals, are not compatible because they attract flocks of birds which jeopardize jet operations. Birds being sucked into jet engines with disastrous results is becoming less commonplace since open refuse dumps near airports are being phased out.

The peripheral area most affected will be the land subjected to the greatest aircraft noise and to the greatest hazard from potential aircraft accidents. AICUZ concentrates its prime emphasis here. The area is basically rec-



Hypothetical Composite Noise Rating Contours

Program

By W. B. GRIFFITHS
Master Planning Branch, NAVFAC

tangular, covering one mile on either side of the runway centerlines and two and a half miles beyond each end of the runways.

Composite Noise Rating (CNR) is one of the systems employed for determining noise impacts from aircraft operations. From case histories involving military installations, an empirical relationship has developed between these ratings and the expected response of residential communities. By grouping the rating into three zones, the community responses can be predicted quite well: *CNR Zone 1* — Some complaints may occur; *CNR Zone 2* — Individuals may complain, perhaps vigorously and group action is possible; and *CNR Zone 3* — Vigorous complaints and concerted group action might be expected.

For specific locations, consideration also must be given to the background noise levels and the existing social, economic and political conditions.

From this rating of expected community responses, it can readily be seen why non-compatible uses include residential areas, schools, churches and hospitals. Other facilities attracting large groups of people are non-compatible because of the accident-potential hazard.

Specifically, AICUZ strives to establish controls over land encompassed by Composite Noise Rating Zone 3, and any areas of high accident potential. Similar controls in portions or all of CNR Zone 2 may be established, depending on local circumstances.

A proposed DOD instruction was included in the draft Environmental Impact Statement filed with the Council on Environmental Quality in March 1973. A 15-month time limit was designated for conducting and approving individual studies of all air installations, starting with issue of the instruction on 30 July 1973. The Chief of Naval Operations furnished interim guidance in April 1973, with more definitive instructions to follow. During this 15-month period, a joint service manual on the total noise problem is being prepared for more explicit guidance in planning

noise-compatible facilities. The general policy of the DOD instruction illuminates the broad parameters of the problem under study:

"As a first priority step, all reasonable, economical and practical measures will be taken to reduce and/or control the generation of noise from flying and flying-related activities. Typical measures normally include siting of engine test and runup facilities in remote areas, if practical, and provision of sound suppression equipment where necessary; and they may include additional measures such as adjustment of traffic patterns to avoid built-up areas where such can be accomplished with safety and without significant impairment of operational effectiveness. After all reasonable noise source control measures have been taken, there will usually remain significant land areas wherein the total noise exposure is such as to be incompatible with certain uses."

Presently, Navy studies are being conducted for four west coast air stations — Miramar, North Island, Moffett

and Whidbey Island; and four east coast air stations — Oceana, Jacksonville, Pensacola and Cecil Field.

The NAS Cecil Field study is a prototype being accomplished by NAVFAC headquarters personnel for guidance in contract coordination for the remaining studies. Several unforeseen items have been discovered there, which will help completion of the remaining studies in a more timely and effective manner.

A side benefit of this broad approach to planning is the improved professional communications between Navy and community planners. Jacksonville, Fla. is presently revising its airport zoning ordinance, also applicable to the military fields within the airport zoning, with NAVFAC personnel providing material to help them update the ordinance with the latest developments in the field. This is a means, not previously provided, which will help to maintain the existing compatibility.

The magnitude and seriousness of the problem dictate the need for prompt resolution. Lands within high noise and accident-potential areas around air installations continue to be threatened with incompatible developments. Delay in protecting these lands from such use will only increase the total cost and complexity of the solution. A preliminary estimate of the cost for acquiring easements to provide this protection for Navy's jet-capable airfields is $450 million, about the cost of replacing one master-jet base.

Therefore, unless we do something constructive about this problem, and quickly, Navy faces the loss of effectiveness in its air arm as curtailment of flight activities occurs.

· Alexandria, Va.

"Noisy Goat" Tests at San Clemente Island for AICUZ Project

By A. D. LEWIS

Head, Standards and Criteria Branch

A Navy A-4, one of the aircraft used in noise evaluation test, undergoes ground tests.

Equipment used to monitor noise levels is unloaded at edge of runway.

Joint service Navy, Marine Corps, Air Force noise evaluation tests conducted 14-19 May 1973 at Navy Auxiliary Landing Field, San Clemente Island, Calif. under the project name "Noisy Goat," (named for the ALF's mascot) will assist in the development of a Noise Exposure Forecast System. Data developed from the tests will provide noise contours to yield forecasts of the noise environment calculated for a specific airfield. Given these contours and other data (such as type aircraft, time of day, noise levels generated by given types of aircraft during take off and landing, and airfield location and utilization) noise environment contours can be accurately computed and predicted.

Ten Navy and Marine Corps aircraft were used over a six day period to measure noises generated in ground runups, takeoffs and fly-overs. Data from these measurements will be used to calculate the required noise contours. The aircraft tested include the Navy's F-14 Tomcat and S3A Viking and the Marine Corps AV-8A Harrier, so the data will be complete and up to date for utilization in the noise abatement/compatibility program.

McMurdo Nuclear Power Plant Closed

By CDR G. E. KRAUTER, CEC, USN
Naval Nuclear Power Unit
• Ft. Belvoir, Va.

The Navy has recently decided that the PM-3A Nuclear Power Plant at McMurdo Station in Antarctica will be dismantled and removed from Antarctica. The 1800 KW plant has been supplying electrical power for the Operation Deepfreeze base at McMurdo since March 1962. The 23-man, two officer crews which have operated the plant over the years have been trained at the Naval Nuclear Power Unit at Fort Belvoir.

Also, technical support and operational direction of the plant has been supplied by the Fort Belvoir Unit. Safety review and overall program direction has been the responsibility of the Nuclear Power Division in NAVFAC Headquarters.

To date, the plant has supplied approximately 60 million kilowatt hours of electricity and provided steam for the production of about 13 million gallons of potable water from sea water. The energy delivered has been equivalent to about 4.5 million gallons of diesel fuel.

The PM-3A was shut down in September 1972 when a routine inspection revealed that insulation around the reactor piping system had become wet. The wet insulation in contact with stainless steel piping could have led to corrosion of the piping. This corrosion, known as chloride stress corrosion cracking, can occur when small amounts of chlorides are washed out of the wet insulation and come in contact with stainless steel under the conditions of stress and elevated temperatures normal in the operation of the plant.

The Naval Nuclear Power Unit and contract specialists performed a partial inspection of the pressure vessel and piping in January/February 1973, and found no evidence of corrosion cracking. However, the high cost of performing a full inspection which would be required before any operations could be resumed, and the unknown probability of success, resulted in the decision to dismantle and remove the PM-3A.

Removal of the plant began this Austral summer season (October 1973 to March 1974) and will continue for the following two Austral summers when it is expected that removal will be completed. All radioactive material will be transported to the U. S. in proper shipping containers for disposal as specified by the AEC. This removal is necessary in order to comply with the Antarctic Treaty, which requires that no radioactive wastes be disposed of in the Antarctic. The necessity to eventually remove the plant from the Antarctic has been recognized since it was installed. The current technical difficulty has simply accelerated plans. The PM-3A site will be returned to its original condition.

Exterior view of nuclear power plant at McMurdo Station, Antarctica.

Although this shutdown is earlier than originally planned, a number of solid accomplishments have been attained during the PM-3A's 10 years of operations:

(1) Demonstration of the ability to operate a nuclear power plant safely and reliably in a remote, hostile environment.

(2) Available to provide power 72% of the time.

(3) A maximum continuous power run of 4400 hours (about 6 months), in 1971. We are not aware of any nuclear power plant which has exceeded this record.

(4) First known use of nuclear energy ashore to make fresh water.

All of these were achieved with a complete annual turn-over of the crew and with remote technical and logistics support.

The shutdown of the PM-3A does not spell an end to the Nuclear Shore Power Systems Program. NAVFAC and the Naval Nuclear Power Unit have continuing and growing responsibilities in providing Radioisotope Thermoelectric Generators (RTG's) and in executing responsibilities assigned to the newly-established Radiological Affairs Support Program (RASP).

RTG's have proven themselves to be highly reliable, long-lived small power sources, valuable for a variety of specialized Navy applications. Plans are underway now for procuring a number of specially designed RTGs for an undersea mission. Although present generators are in the 1 to 100 watt range, a 2 kilowatt unit is being developed by NAVFAC.

Personnel from the Radiological Affairs Support Office at the Naval Nuclear Power Unit visit naval activities to assist in achieving a high degree of safety in the use of industrial x-ray machines and other equipment which uses nuclear radiation. This office also has responsibilities related to AEC licenses for Navy use of radioactive material and to the review of the design of portions of Navy structures which house radiation producing equipment.

Men from the Naval Nuclear Power Unit will continue to be assigned to the army's nuclear plant, the MH-1A, located in the Panama Canal Zone. The increasing role nuclear power is playing in the national energy picture is certain to be reflected in the Navy. The nuclear expertise of NAVFAC and the Naval Nuclear Power Unit is continuing to insure that the full benefits of nuclear technology are available to solve energy problems of the Navy.

Nimitz Library

Naval Academy Library Dedicated

By RICHARD S. GOODWIN
Project Manager

• Annapolis, Md.

The Naval Academy's new Nimitz Library was dedicated on September 7, 1973. The new facility, authorized at $9,741,000 in the FY 1970 MCON Program and completed in early 1973, was named in honor of Fleet Admiral Chester W. Nimitz who gained fame as Commander in Chief of the Pacific Fleet during World War II.

The four-story granite building was designed in the same modified French Renaissance style as the recently completed and nearby Science and Mathematics Building (Michelson and Chauvenet Halls).

The Nimitz building has a gross area of 225,000 square feet, with a capacity of 650,000 volumes and accommodation for 1,500 readers. Of modular construction, the open book stack arrangements permit easy access to the Academy's book collection, with nearby study space suitable to individual needs.

Special features include a computer terminal room, microfilm reading facilities, audio-video room, group study rooms, special collections reading room, a map room, typing room, seminar room, faculty studies, and lounges.

The Special Collections division contains facilities to preserve and make available for study old and rare books, manuscripts, photographs and other materials requiring special handling. The Naval Academy Archives are located adjacent to the Special Collections Division.

In addition to the book collections, the new facility houses the Division of U. S. and International Studies, with classrooms, lecture halls, a language laboratory and offices, a photographic laboratory, and the Educational Resources Center which distributes closed circuit TV academic programs throughout the Academy.

The Nimitz Library is the second major new academic building to be completed in the Academy's modernization master plan. (*See TNCE Summer Edition 1972 p. 4*) The Science and Mathematics Building, completed in 1968, was the first. The Engineering Studies Complex, third and last, was authorized in three phases in the FY 1971, second and third MCON Programs at a total cost of $27,723,000, and is currently under construction with completion expected in 1975. Various other projects are included in the overall modernization program.

The Chesapeake Division, Naval Facilities Engineering Command, Washington, D. C., was responsible for the project during design and construction phases.

The NAVY'S FUEL CRISIS

. . . 30-day storage ordered

By R. A. FITZGERALD, P.E.
Utilities Division, NAVFAC

• Alexandria, Va.

The nation's energy crisis is rapidly affecting the navy's utility support capability. The critical nature of the coming fuel shortages was foreshadowed for many installations during the 1972-73 heating seasons: these problems will seem minor compared with what's to come.

The natural gas shortage will be one of the first real aspects of the energy crisis to be felt by naval activities. Recent wholesale changes from coal and oil to gas to conform to environmental restrictions have thrown a back-breaking load on gas supplies already stretched by "normal" load growth. Some west coast activities have been told to expect a decreasing availability of natural gas estimated to reach up to 235 full days of curtailment during the 1976-77 heating season. It has also been estimated that the shortage will cause interruptible gas to be unavailable on the east coast from November of *this* year.

Recognizing the magnitude of this supply/usage imbalance, the Federal Power Commission anticipates critical natural gas shortages for much of the nation during the coming year and has developed a curtailment priority plan to equitably distribute the available supply. This plan gives preference to domestic users and lowest priority to large industrial users, including defense activities. It is possible that as a result such systems could be without gas throughout the coming winter.

DOD realizes that many systems burning natural gas with oil standby have inadequate fuel storage facilities to carry them through a winter of interruption. In order to meet heating reliability requirements, DOD has directed that systems burning fuel oil or natural gas with fuel oil standby must have a minimum 30 day storage capacity, based on the coldest period of the year. A recent survey of potential problem areas has identified a navy-wide storage deficiency of approximately $8 million. Of this amount $760,000 has been further identified as critical enough to demand immediate urgent minor construction support. The rest of the deficiency correction actions will be submitted as regular MILCON or minor construction projects.

The efforts to provide this needed capability will create competition for already scarce construction funds. This, and the evident short response time, make it necessary that other alternatives be considered. All activities using No. 2 fuel oil as primary or standby fuel should review the possibility of converting to the more available residual oil. This review will require a case-by-case engineering evaluation of the feasibility of modifying existing plant equipment and auxiliaries to burn the heavier fuel.

Other alternatives must also be considered, such as: conversion of existing storage facilities and alternative temporary storage facilities such as fuel barges, fuel bladders, railroad tank cars, etc.

The 30 day storage requirement is a symptom of the real problem: the fuel energy shortage. It is imperative that every point of energy consumption be reviewed and all unnecessary usage be identified and eliminated. Maximum consolidation of functions and critical review of utilities services to little used areas and buildings will have a significant impact on total requirements. A realistic, all out energy conservation program must begin now if we are to avoid enforced rationing and actual loss of utility support to the fleet.

NAVFAC Presents Energy Alternatives to AEC

By H. C. LAMB
Program Execution Division

• Alexandria, Va.

NAVFAC is deeply involved in the "energy crunch" and its eventual effect on the naval shore establishment. In June, the President directed the Atomic Energy Commission to develop recommended energy research and development programs for fiscal year 1975 as part of an overall five-year $10 billion program to make America self-sufficient in its energy requirements.

The AEC in turn requested inputs from government agencies, including the Department of Defense, and NAVFAC responded with an innovative, far-reaching proposal totaling around $1 billion for the five-year period, and $40 million for FY 75.

These amounts represented almost 80 percent of the total Navy submission. Through additional review with Chief of Naval Material (NAVMAT) NAVFAC's five-year package was reduced to $300 million, primarily through the deletion of a single large program, and $16 million for FY 75.

This package has been forwarded to the AEC for inclusion and review with the programs submitted by other agencies. The programs forwarded represent approximately 40 percent of the total Navy submission and include varied projects. Included are nuclear power, geothermal energy, solar energy in the form of house heating and cooling devices, and a large power plant for use at Guam using the temperature differences between warm surface water and cold deep water. Also included are: wind driven power generation for Adak, energy conservation in new and existing facilities, absorption air conditioning, and use of coal in small heating plants.

CAPSE

POWER SYSTEM SAFEGUARD

• Alexandria, Va.

Private industry loses one to three billion dollars annually because of unscheduled power outages. Throughout the naval shore establishment, as well as private industry, many system operators feel that because their electrical distribution system is new or has not experienced a recent failure it will continue to operate safely and reliably.

Don't be fooled!

Unscheduled outages can and do occur. Sometimes the outage is caused by the explosive failure of a system component.

Nationally, one third of all circuit breakers are inadequate, faulty, or out of adjustment. The major cause for this condition is neglect. Neglect causes unscheduled and unnecessary outages and the production losses resulting from these outages. Additionally, the naval shore establishment experiences 150-200 fires annually which are directly attributed to malfunctions of the electrical system.

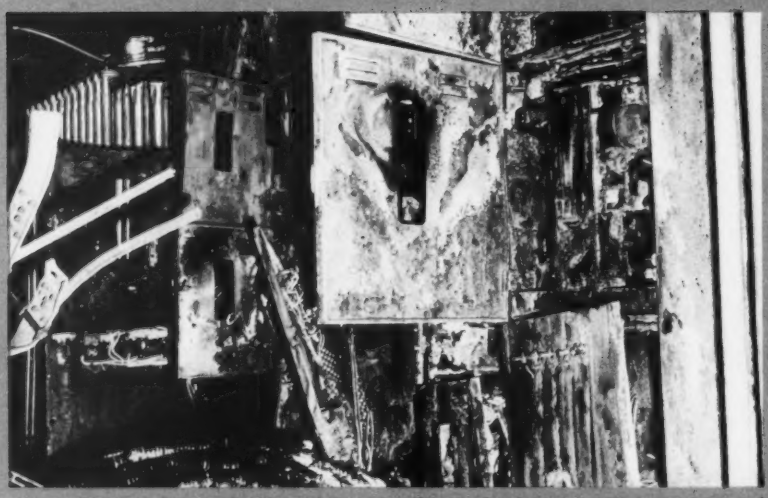
One of the best types of insurance against these losses is a periodic testing and maintenance program for relays, circuit breakers and motor overloads. Additionally, NAVFAV EFD's use Computer Assisted Power System Engineering (CAPSE) facilities to aid in determining the reliability and safety of the navy's electric power distribution systems.

The reliability and safety of an electric power distribution system is largely dependent upon the proper operation of its circuit breakers. System circuit breakers range in size from the small molded case type we see in homes and building panelboards to those in major substations which are the size of a small shed.

Circuit breakers are intended to provide a way to disconnect a circuit under normal and abnormal conditions such as an overload or fault. In order to disconnect a circuit under abnormal conditions the breaker must first sense the condition and then must physically interrupt the flow of the current.

Sensing Elements

Sensing elements are the brains of a circuit breaker. In large breakers the sensing elements are relays, and in small breakers the sensing elements are integral with the breaker. In both cases, these sensing elements signal the breaker to open; the mechanical operation of the sensing element is independent from the breaker mechanism which causes the main contacts to physically separate. Thus, a breaker can be turned off and on without exercising the mechanical portions of the sensing elements. Because of this mechanical separation it is mandatory to periodically maintain and test the sensing elements. An annual testing and maintenance program can eliminate problems of sensing element failure and will be discussed later.



Results of an explosion and fire caused by a circuit breaker that was not rated sufficiently to interrupt the available short circuit current.

When a system is designed and built, the sensing elements are selected, sized and adjusted for specific conditions. As the system size and capacity grow, the circuit conditions, for which the breaker sensing elements have been set, change. This change causes the existing setting to become obsolete and selective operation of the breakers may be lost. Losing selective operation of breakers causes the operation of more breakers than necessary to isolate the problem, and causes an outage to a larger area, possibly the entire activity. Major changes to an electric distribution system may even require the replacement of some sensing elements in order to insure selective breaker operation.

The engineering tools used to determine the adequacy of protective devices are (1) *a system fault study* and (2) *a protective device coordination study*. The fault study determines the amount of short-circuit current available throughout the distribution system.

These short-circuit current values are first compared with the interrupting rating of the circuit breakers to see if they are capable of interrupting the available short circuit current. As service size increases, the amount of current available to a short-circuit current can increase to a value above the rated interrupting capacity of some circuit breakers. The significance of the comparison of available short-circuit current versus circuit breaker interrupting capability is that if a circuit breaker attempts to interrupt a short-circuit current greater than it is rated to interrupt, it can fail explosively, cause a fire, create extensive damage and endanger personnel.

The fault study is also used to ascertain if the existing settings of the circuit breaker sensing elements will provide selective operation. If not, a coordination study must be performed. The study will determine new settings for the sensing elements when necessary. It will also recommend replacing any sensing elements required to insure selective operation of all system circuit breakers.

Earlier, it was stated that a third of all circuit breakers are inadequate, faulty or out of adjustment. Neglect of circuit breakers relays, and motor overloads causes fires, unscheduled outages and production losses. A good maintenance and testing program for these important system components will reduce these costly losses. Relays should be cleaned and tested annually. Circuit breakers which have integral sensing elements should be maintained

By D. M. HANNEMANN, P.E.
Utilities Division

annually, or bi-annually, depending upon the type of service they receive. Large circuit breakers should be thoroughly inspected and maintained whenever they interrupt a short-circuit.

Motor overloads are also an important part of the protection scheme and are often overlooked. They should be tested and maintained annually. Testing and maintenance will insure that the breakers will operate properly when called to do so. Failure to maintain breaker and sensing elements will result in sluggish operation or, if neglected long enough, parts will become frozen and fail to operate. Testing insures that the devices are operating properly and within the time specified for their operation by the latest coordination study.

System Evaluation

The importance of periodic evaluation of electric power distribution system protective devices cannot be overestimated. System evaluation, including a fault and coordination study, is necessary every three to five years, and whenever major changes are made to an electric distribution system. These fault and coordination studies are in addition to a thorough maintenance program for the protection devices.

EFDs can provide activities with limited assistance in determining whether their electrical power distribution system is safe and reliable. CAPSE computer facilities are available at the EFDs to conduct system fault studies. In fact many of the large activities are already "on the computer" and each EFD has a program to include all activities in this data bank.

Fault studies and coordination studies are time consuming tasks. Much of the work associated with this task is in gathering the system data which is necessary for this type of engineering analysis. Activities can assist by gathering this data through their in-house resources or by obtaining A&E services to assist the EFD.

It is recommended that each public works officer appraise his electrical distribution system and put forth the necessary resources to insure that it will operate safely and reliably. This effort includes continued emphasis on a protective device maintenance and testing program and periodic system evaluation. This is the only way the Navy can insure its electrical distribution systems are as safe and reliable as possible.

More Shore Power to the Fleet

By JOHN N. AGNOS, P.E.
NAVFAC HQ, Design Division
• Alexandria, Va.

When ships or submarines are at port in a naval station or shipyard, it is more economical to supply power for their normal electrical needs and operation from permanently installed electrical sources on shore (pier hotel service) than to have the vessels generate their own power. Among the advantages of shore power are that it enables maintenance to be performed on shipboard equipment, requires minimum operating personnel, extends the life of the ship's generators, reduces pollution, and lessens operating and maintenance costs.

Electrical power requirements and demands on shore facilities have increased greatly in recent years, primarily due to the modernization of older ships, the acquisition of new type ships, and the new liberty policies. As an example, ampere requirements of today's nuclear attack carriers are in excess of 10,000 amperes at 450 volts. Those of certain classes of cruisers and destroyers range from 3200 to 5800 amperes. Nuclear submarines require up to 1600 amperes for hotel service and in excess of 1600 amperes for testing and check-out operations.

With this continuous increase in power demand, it became obvious that the existing electrical facilities at piers and drydocks of naval shore activities could no longer meet the needs. It was also evident that previously used methods were no longer feasible or economical. Therefore, a new design had to be developed in order to minimize expenditures and at the same time maximize the service. An additional feature required was to enhance the safety of the operating personnel.

Voltage drop and power line losses necessitate larger size conductors to deliver the same amperes over longer distances, compared to sizes needed for shorter distances. It was believed, therefore, that the most economical way to supply the higher electrical demands was by locating the substations as near as possible to the ships they served. This could be accomplished by (1) installing (15KV) primary feeders on the pier or drydock, which in return would shorten the secondary feeders, (2) locate the substations in vaults under the piers so that these would not interfere with the pier's operations, and (3) install standardized receptacle/plug outlet service on the piers to meet the load requirements and enhance the safety of the personnel. All these should be accomplished at the lowest life cycle cost.

To verify these assumptions and to develop the necessary standards, a contract was entered into with a commercial A&E firm. The contractor prepared a study and developed standard drawings for a typical new pier (1000′ long) and a typical rehabilitated pier, covering the entire electrical distribution system. The standard drawings provide design guidance based on the results of the study and long experience in the application of electrical power to industrial facilities. They also incorporate those special components that are applicable to the supply of shore power to ships.

The new standard drawings and the study have been distributed to the EFDs and other interested naval commands. These standards are applicable to piers having different dimensions and different KVA requirements than those indicated on the standards.

The new standard designs include the following features:

1. Location of electrical substation vaults, including ventilation system for the vaults.

2. Primary 15 KV class distribution system.

3. Location of electrical power outlets (each outlet consisting of several 3-pole, 400 amp receptacles).

4. Secondary 480 volt distribution system.

5. Individual low voltage power circuit breaker for branch feeder protection and safety.

6. Interlock and remote control of branch circuit breakers with indicating lights for safety of operating personnel.

7. One way receptacle/plug mating, which eliminates the possibility of cross-phasing.

8. Elimination of single-phasing.

9. Provisions that plugs cannot be connected or removed while energized.

10. Shore hardware (MIL-C-24368 SHIP's) same as on the ships.

The new pier design for electrical facilities meets the fleet's requirements and provides flexibility, reliability, and safety at a substantially lower cost to the Government.

NCEL Introduces Portable Paint Identification Kit

• Port Hueneme, Calif.

The Naval Civil Engineering Laboratory, Port Hueneme, has developed a simple, portable kit for identifying old, weathered paint. Before the comparatively inexpensive kit was developed by chemists Dr. R. W. Drisko and Dr. H. P. Vind, infrared spectrophotometers (each costing several thousand dollars) were used to obtain the necessary information before repainting.

Recognizing the need of field activities for a more practical method of paint identification, NAVFAC requested NCEL to develop a simple procedure and kit to be used by field personnel with no laboratory experience.

Dr. Vind and Dr. Drisko developed five basic test tube scale experiments: (1) pyrolysis, (2) solubility, (3) chlorine, (4) nitrogen, and (5) polyester, which provide the desired identification on the composition of weathered paints. In addition, the kit has tests for detecting lead and mercury in paints, an important capability when testing paints used on housing.

The identification procedure first determines the paint classification (i.e. the method by which it cures) and then the actual generic type. A manual provides the simple step-by-step procedure for each test and specifies the variout reagents and equipment required. It also lists all possible results. Every test and each possible test result are numbered. The user simply determines where the numbered results fit into prepared charts in order to identify the paint.

The kit, which fits into an attache case for easy carrying, costs $165 when purchased from a commercial company but is $15 less when ordered through the General Services Administration.

The laboratory believes the kit provides an important field service not previously available. Effective use can result in appreciable savings in maintenance painting of structures throughout the Department of Defense establishment.

High-Strength Electromechanical Cable

By PATRICK CAVE

Seafloor Engineering Program Manager

• Alexandria, Va.

Under the direction of the Naval Facilities Engineering Command, the Naval Undersea Center (NUC) Hawaiian laboratory and the Naval Underwater Systems Center (NUSC) New London laboratory are pursuing the development of electromechanical cable that combines high strength with low specific gravity.

Cables of this type are needed for use in undersea acoustic arrays, cable-deployed systems, and deep submergence devices, such as an underwater observation platform. This cable will minimize the size and weight of the deployed cable, reduce the deck handling gear requirement, increase the payload fraction for over-the-side operations, and increase overall system reliability and safety.

Activities in this program are being focused primarily upon: development and testing of PRD 49, fiber "B", and polyester strength members to replace steel strength members, and the fabrication of prototype electromechanical cables using these new materials. PRD-49 and fiber "B" are two new high strength organic fibers which have recently been developed.

As an example of the data being developed, test results just completed on a composite fiber "B" polyurethane-impregnated strand exhibited a tensile strength of over 300,000 psi, a Young's modulus of 9 million, a specific gravity of less than 1.4 and an ultimate stretch of less than 4 percent. A typical strand is 0.044 inch in diameter with a breaking strength of 425 pounds.

Several cables have been fabricated and tested. One of these cables has a 12,000 pound breaking strength and is weightless in water to any depth.

NCEL Becomes Part of NCBC Port Hueneme

• Port Hueneme, Calif.

On 1 January 1974, the Naval Civil Engineering Laboratory became the Civil Engineering Laboratory (CEL), Naval Construction Battalion Center, Port Hueneme. The change in name and in organizational placement will not affect the laboratory's assignment as the Navy's principal RDT&E center for shore and seafloor facilities nor for the support of Navy and Marine Corps construction forces.

The laboratory will continue to have a Unit Identification Code (UIC) number and receive its own mail and classified materials. Personnel will remain the same, and will continue work in the same buildings they have occupied since 1950, when NCEL moved to Port Hueneme.

A Year in Vietnam
CONSTRUCTION MANAGEMENT TRANSITIONS

By LYLE JONES
Assistant for Federal Agencies,
Interagency Construction Division
• Alexandria, Va.

Fiscal year 1973 has now entered the annals of the Naval Facilities Engineering Command.

The year started with the momentum of the giant joint-venture construction machine, known as RMK-BRJ under CPAF (cost plus award fee) Contract NBy-44105, brought to a halt on 30 June 1972.

Its record, which can only be described in superlatives, includes—$1.9 billions of ports, airfields, cantonments, storage depots, hospitals and highways built throughout the South Vietnam in the 10-year span of the contract.

During the fiscal year 1973 the increased award of local currency funded lump sum contracts to indigenous contractors given emphasis in mid-1971 showed that an adequate and responsive capability existed for residual U. S. construction programs.

The first million-dollars-plus contract appropriately named Lump Sum I was awarded in September 1971 to a Vietnamese contractor for Delta roadwork and was completed 16 months ahead of schedule in December 1972. A second contract for over $3 million, an infantry school south of Saigon, was awarded December 1971 to a Vietnamese joint venture contractor and is proceeding on schedule for a December 1973 completion.

A significant NAVFAC organization change occurred when the OICC (Officer in Charge of Construction) Vietnam established in 1 July 1965 to manage the burgeoning facilities build-up was disestablished 1 November 1972 in consonance with the diminishing workload.

This change capped the consolidation over the previous year of the OICC RVN administration and accounting personnel within OICC Thailand. The decision was made that the OICC Thailand would again resume its pre-1965 role as the OICC for Southeast Asia with DIRCONS (Directors of Construction) in Thailand, Laos, Cambodia, and now Vietnam. Thus, the construction execution organization remaining in Vietnam became known as the DIRCON Vietnam, under the direction of the OICC, Thailand.

During the period July 1972 to the ceasefire in late January 1973 the DIRCON workload remained fairly constant at between $15-20 million with 25-30 contracts, the vast majority with Vietnamese contractors.

The ceasefire of 27 January 1973 called for removal of all U. S. military combat forces within 60 days. The ceasefire agreement and subsequent protocols also set a drastically reduced military personnel ceiling for the DIRCON. A new organization known as the DAO (Defense Attache Office) came into being as successor to the COMUSMACV (Commander U.S. Military Assistance Command, Vietnam). All remaining U. S. military personnel were assigned to the DAO. The DIRCON, Captain E. H. Belton (now Captain Jack Wright) moved into one of the DAO military billets completing the transition of the DIRCON to its (ceasefire plus 60 days) required posture of 27 U. S. DOD personnel. Non-U.S. personnel were not counted against the ceiling.

The impact of the ceasefire transition is shown by the following tallies of the OICC and later DIRCON Vietnam:

The August 1972 counts shows the post-CPAF closeout and pre-disestablishment count of the OICC. The level of the DIRCON organization at pre-ceasefire and ceasefire is shown as of December 1972 and April 1973 respectively. The latest DOD personnel count is that of August 1973. Several of the civilian positions are now being filled by TDY personnel from our NAVFAC worldwide organization and response to requests for volunteers for this TDY has been most gratifying.

Workload since the ceasefire has remained at the pre-ceasefire level and is expected to continue until early 1974 before declining. In January 1974 the value of work placement is scheduled to overtake work input and as workload decreases there will be further downward adjustments in the number of DIRCON RVN personnel.

	August 1972	December 1972	April 1973	August 1973
Military	33	15	1	1
U.S. Civilians	36	17	26	19
	69	32	27	20

BIG YELLOW FLUSH TRUCK

. . . cuts sewer maintenance costs by 88% in first season

By CWO2 W. R. MANGRUM
Assistant Operations Officer

PWC employee at Great Lakes attends flush hose control from truck while helper observes results at next manhole.

• Great Lakes, Ill.

Public works management is not unfamiliar with the problems of maintenance and cleaning of sanitary and storm sewers. Nor are they unfamiliar with the slogan "be more productive with fewer dollars." In combination, it becomes necessary to maintain miles and miles of sewer lines with only a minimum amount of dollars.

The Navy Public Works Center (PWC) at Great Lakes, Ill. has recently implemented a program that will do just that: clean more sewers with less money.

After reviewing technical data on high velocity sewer cleaners, PWC Great Lakes decided to launch a new cleaning program on PWC's sanitary sewers, utilizing a high velocity sewer cleaner. This sewer cleaning vehicle utilizes a special high velocity hose (1,000 psi 60 gpm), fitted with a steel jet nozzle fed directly into the sewer. By jet action the nozzle is propelled up the line pulling the hose behind it. The forward jet breaks accumulations, and when the hose is withdrawn under pressure, the rear water jets scour the line. Operations of this type require only a two man crew — usually a journeyman plumber and a plumber's helper from the PWC maintenance shops.

However, PWC has trained and qualified personnel from other trades as well. This has developed a back-up capability and allowed for further expansion of the program by addition of other shifts as desired.

Regardless of the methods used, Great Lakes has always had two problems in scheduling sewer cleaning operations: the work is seasonal (May-Oct.) and sewer cleaning can conflict with other scheduled public works jobs. These problems have been partially solved by establishing a two-shift operation. The "big yellow flush truck" and its associated operations can now be observed from 0600 to 2000 five days a week.

Each shift maintains a log book, annotating problem areas and recording the lineal footage cleaned during the shift. Subsequent calculating of labor costs for cleaning operations, adding repair costs of the equipment and dividing by the total length of pipe cleaned, provides reference data for future usage.

Two-man maintenance crew re-rolls flush hose on rear of truck preparatory to moving on to next pipe section.

Prior to the initiation of this program, the cost of cleaning 42 miles of sanitary sewers was financially prohibitive. The old method of "rodding and bucketing," utilizing shop forces, cost an average of $1.62 per foot. This method was also very slow — crews averaged only 300-400 lineal feet per day. As a result no preventive maintenance could be afforded and stoppages resulting in emergency repairs and inconveniences were not uncommon.

The results of the new method will not be fully realized until all the maintenance costs for future seware stoppages and miscellaneous repairs, resulting from emergency cleaning of obstructions, can be totaled for FY 74. To date, however, the new program with its smaller crew size, consolidated equipment, faster set-up time, and better cleaning methods has reduced the costs of initial cleaning, has vastly improved efficiency and has begun to eliminate emergency costs.

From 12 May 1973 to 15 August 1973 the Great Lakes PWC has cleaned 31.36 miles of sanitary/storm sewer lines of various sizes, cleaning approximately 1,800 feet per day, at an average cost of 13.8 cents per foot, including maintenance costs for sewer

cleaning equipment. As high as 3,300 feet have been cleaned in one eight hour day.

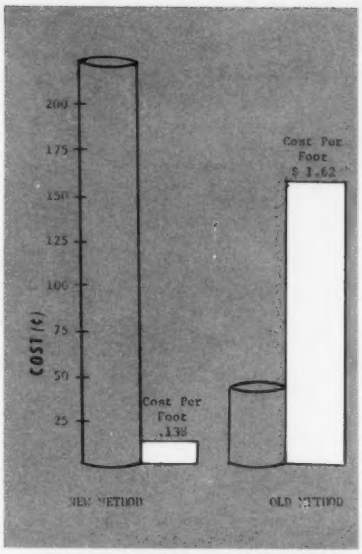
As a result of the lower costs of cleaning sanitary sewers, two major Great Lakes naval activities owning storm sewers have requested the PWC to use this operation to clean their storm sewers, a badly needed operation that heretofore was cost prohibitive.

The precise breakdown of footage cleaned and cleaning costs for storm sewers has not been determined at this time. It would appear that storm sewer cleaning, including the cleaning of laterals and catch basins, will be approximately three times as expensive as cleaning sanitary sewers due to the excessive build up of roots and debris and requirements of additional equipment. The old methods were *extremely* expensive, e.g., *one cleaning job cost the funding activity $17.21 per foot.* Admittedly this example is an extreme case, but it does vividly illustrate the cost reduction-potential of the new method.

The flush truck program is an advance to provide more efficient and proper maintenance of an area long deferred due to fund shortages. As more experience is gained in the future, the costs will continue to decrease, allowing for additional maintenance on a more frequent basis, for less money, at the Great Lakes Naval Complex.

The PWC plans to clean PWC-owned sewers again next year. With an experienced crew, less obstructions and less debris to remove, the footage cleaned per day will be considerably increased and 4,000 to 5,000 feet per 8-hour day appears to be attainable.

Based on the data gained during this cleaning and the amount of emergency stoppages experienced between cleanings it will be possible to lay out a repetitive sewer maintenance program that is highly cost effective.



Dramatic savings are demonstrated by this chart showing cost-per-foot of old and new pipeline cleaning methods.

Project Specifications by Computer

By RICHARD H. WELLES
Director,
Specifications and Cost Division
• Alexandria, Va.

The preparation of specifications has come a long way since the days of the scissors and paste pot. The computer has now gotten into the act. Much of the drudgery associated with the writing of these documents has been reduced or eliminated and the term "automated specifications" has been coined.

Unfortunately, these words connote meanings which simply are not true. You cannot press a button as in a vending machine and have a completely prepared project specification come out. The significance of automation lies in the fact that *the computer prints out automatically those parts of a stored master specification that do not have to be altered.*

An explanation of the process of preparing a project specification by the use of the computer should create a better understanding of this comparatively new technique. Three elements are essential: (1) hardware (the computer); (2) software (the program); and (3) a master specification. The requirement for *hardware* within the context of NAVFAC's needs envisions a computer system which would store the master specification and include terminals at our Engineering Field Divisions (EFD) capable of communicating with it.

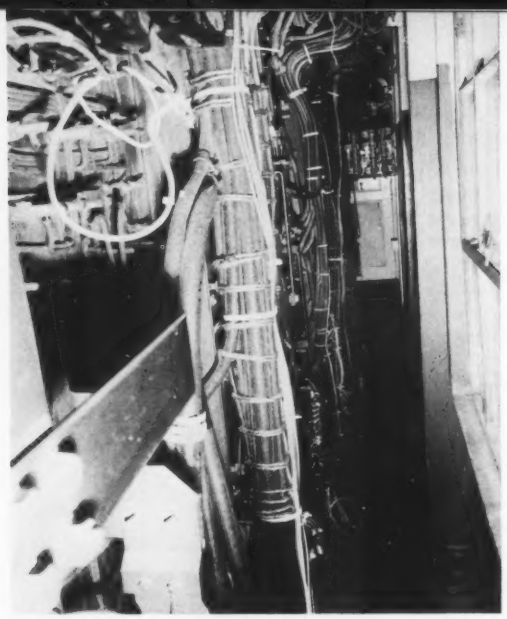
The software would be a program which permits the terminal operator to extract from the master specification those parts that are relevant to a project. The *master specification* would be a collection of construction elements common to most projects. For NAVFAC, this would constitute all of the guide specifications organized as a typical project specification.

How would this system work for NAVFAC and how would it differ from the usual practice? The initial procedure is exactly the same as the present. The specifying engineer or architect studies the project drawings and lists those elements which he must cover in his specification. From an index, he then checks off the various sections of the master which pertain to his project. Through the terminal, these sections are printed and returned to him. (In the present process, he would pull from his files the pertinent guide specification.) The specifier takes the sections from the master and makes changes and additions necessary to fit the project; if the master does not cover an element or section, he must write it. This marked-up version goes back through the computer which then prints back the tailored version of the master by means of the prepared program. The specifier proofs only that portion of the master which he has changed or added. This final draft goes back to the computer through the terminal operator and the project specification is then ready.

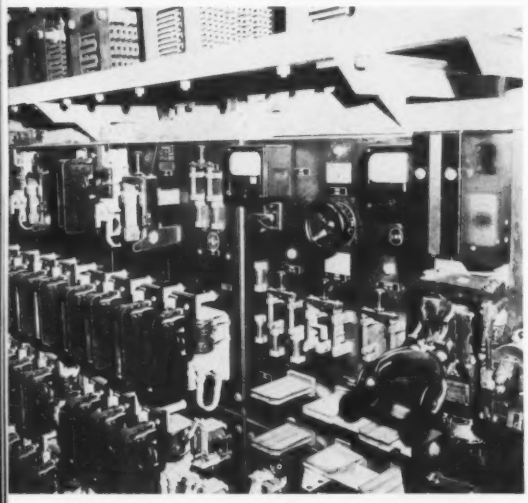
With the old method, the specifier marks up the guides which have to be typed and proofed. There have been some variations in this latter process by use of the Magnetic Tape Selectric Typewriters which have helped to reduce proofing time. There are also variations in the use of the computer. For example, if terminals are not available, mail can be substituted as the communication link with the computer. This is a time consuming process which would not be acceptable for NAVFAC projects with tight deadlines.

The cost effectiveness of an automated system is directly related to the degree of coverage of the master specification. The less the master has to be altered or added to, the more economical the system becomes.

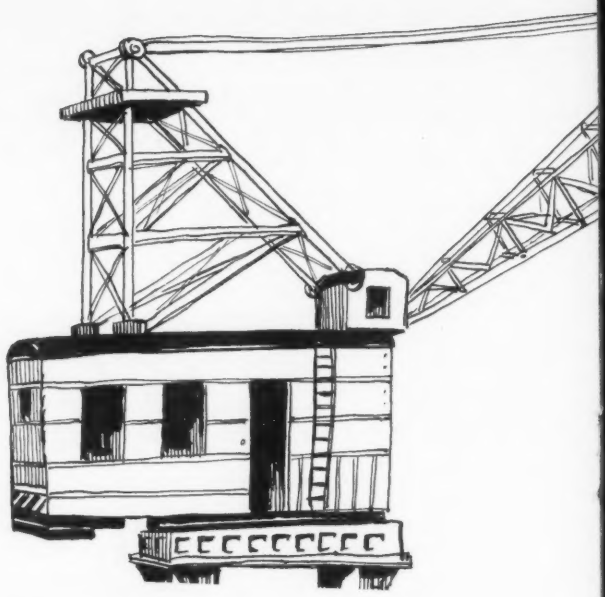
An automated specification system, therefore, does not change the role of the specifier: he still must go through the same basic procedures that he always has. It will, however, reduce the time required to prepare specifications and thus give him more time to devote to their technical aspects. This should result in better specifications, fewer disputes and fewer claims.



DOUBLE EXPOSURE — Original electrical wiring was back connected and exposed (above) as were the panels and components (below) that invited dust and moisture interference.



UP TIGHT — New front connected wiring and components are now encased in dust proof cabinets with small space heaters (as pictured in lower left of photograph) that prevent moisture condensation.



• Vallejo, Calif.

The backbone of heavy lift capability at naval shipyards today is composed of portal cranes of WWII or earlier vintage. While these cranes were conservatively designed and well constructed, the age and condition of these cranes were not compatible with present day performance requirements and funds for their replacement were not available.

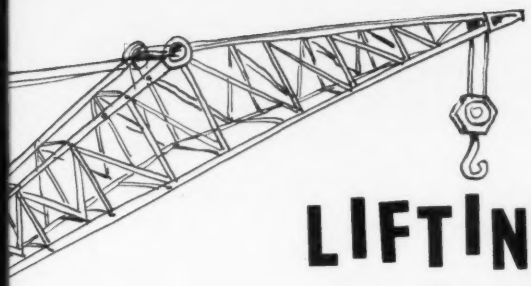
A typical shipyard portal crane with a lifting capacity of 50 long tons, weighs approximately one million pounds, and would cost about a dollar a pound to replace at today's costs.

The Public Works Department at Mare Island Naval Shipyard set as its highest priority goal "reliable crane service." To provide the required reliability with available resources, a deficiency analysis program was established to identify areas of frequent malfunction and to direct corrective effort to the least reliable systems and components.

Under the deficiency analysis program, malfunctions and breakdowns were investigated, analyzed, and tabulated in four major classifications: electrical, mechanical, diesel, and structural.

The results of the deficiency analysis program agreed with statements in DM-38, Weight Handling Equipment Design Manual, that reliability depends more on electrical components than on mechanical or structural components. Of the deficiencies analyzed on four portal cranes, 42% were classified as electrical. Diesel power units accounted for an additional 37%, with structural and mechanical problems combined making up only 21% of the portal crane deficiencies.

Although electrical and diesel problems accounted for 79% of the deficiencies on the four portal cranes, the estimated cost per crane to replace the electrical systems and diesel power units with modern, heavy-duty components *was less than one-fourth the cost of one new, comparable crane.* For the cost of replacing the least reliable crane, which had 32% of the deficiencies, all four cranes could receive new electrical systems and diesel power units, correcting the causes of 79% of the deficiencies. A phased



LIFTING OLD CRANES INTO SHAPE

By LT. W. SAMUEL NIECE, CEC, USN

program was begun of electrical and diesel upgrading, scheduling one crane to be out of service as shipwork permitted.

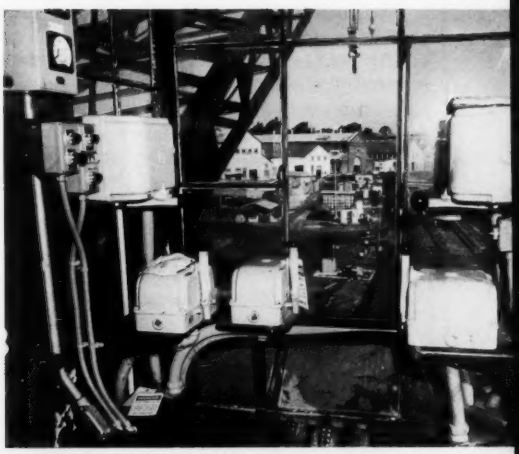
The electrical system upgrading work package can be grouped around the following three basic objectives: heavy duty components, physical arrangements (that permit easy inspection and maintenance), and protection from dust, moisture, and corrosive atmosphere.

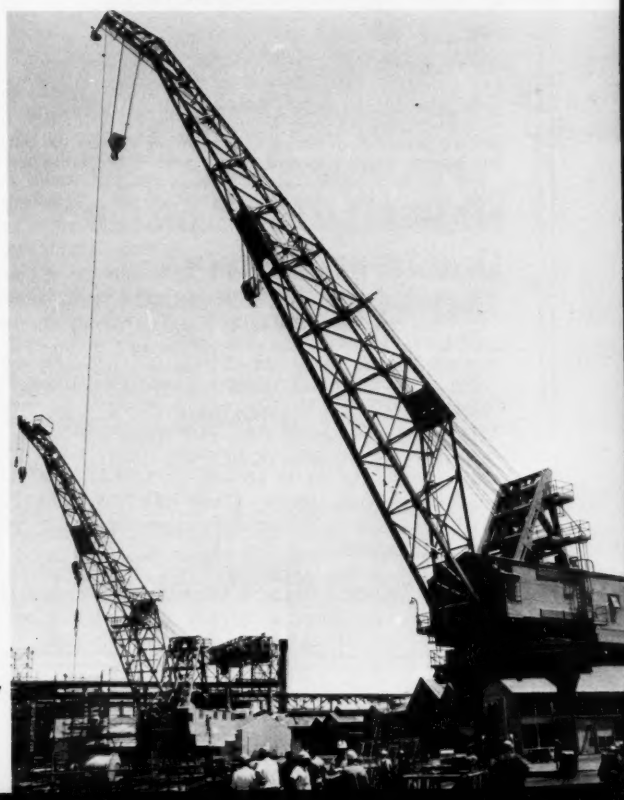
Steel mill and heavy industrial service class components were specified, except for hoist contractors, where even heavier (250% oversized) amperage ratings were called for to preclude any possibility of contact welding.

The original installations used open panels with components mounted on the front and connecting wiring on the back in a narrow space between the panel and the exterior wall of the machinery house. The new components were mounted in front-connected cabinets with the wiring visible and accessible. Mezzanine platforms were installed for service.

Protection from dust, moisture, and corrosive atmosphere was achieved by mounting the new components for each subsystem in a separate, dust-tight cabinet with hinged access doors and thermostatically controlled space hearters to prevent moisture condensation. Motor and brake windings were cleaned and encapsulated in baked epoxy resin varnish. Heaters were installed in motor and brake housings. All interconnecting wiring was enclosed in conduit or duct. In addition to the precautions to keep everything dry, instrumentation was installed to detect partial ground faults before they result in malfunction.

The new electrical systems were furnished and installed under a separate construction contract for each crane. All diesel power units were procured under a single supply contract. The replacement of each diesel was accomplished by shipyard workers simultaneously with the contract replacement of the electrical system. Also performed was maintenance work on the running gear and repainting the exterior of the crane while it was out of service.





CRANE'S EYE — View of portion of Mare Island Naval Shipyard from operator's bridge of restored portal crane (above) with one of the four modernized units (below) back in the action at the Vallejo, Calif. ship repair complex.

Trends in Navy Yards and Drydocks

By F. T. KIEFERLE

• Alexandria, Va.

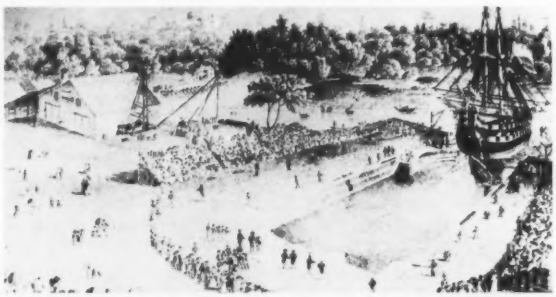
The first Navy graving drydocks were completed at the Boston and Norfolk Navy Yards in 1833. After 140 years, these drydocks are still operable although infrequently used because of their small size.

There are now 48 graving drydocks in the naval shipyards to service the fleet and several new drydocks are under consideration. Changing ship geometrics and the incredible complexity of modern ships forces a continual review of the facilities to produce and service the Navy's ships.

The review is the responsibility of the design division, waterfront and weight-handling branch of the Naval Facilities Engineering Command where an in-depth study of drydocking "state of the art" and shipyard industrial engineering was recently completed.

The study included methods of technical and economic evaluation and applications for shipyard modernization. A current study concerns new high-ship-blocking designs for drydocking ships with keel mounted sonar domes. Also underway is a field test of an electronic load-indicating device for drydock portal cranes to enable a crane operator to determine the safety of the hook load and reach at all times during a weight-handling operation.

The ships of the future are expected to be larger and even more sophisticated and will, accordingly, require larger and more sophisticated drydocks to accommodate them.



Artist's depiction of sailing ship entering the new dry dock at the Boston Naval Shipyard during dedication ceremonies.

NAVFAC/UCT-1 Install Undersea Sensors

By ENSIGN ROBERT H. MAYER, JR., CEC, USNR

Ocean Engineering Program Office

• Alexandria, Va.

NAVFAC's Ocean Engineering and Construction Project Office (CHESDIV FPO-1) and Underwater Construction Team One (UCT-1) of the 21st Naval Construction Regiment recently completed successful installation of five sensor systems in depths varying from 70 to 2,600 feet off St. Croix, Virgin Islands. These underwater installations of *Project Classic Thicket* were conducted in support of undersea research.

Working within very tight time and monetary constraints, CHESDIV FPO-1 developed a construction system capable of installing the already designed and procured sensor systems within precise positional tolerances.

Each of two deep water systems, consisting of a single sensor system attached to a taut-moored sub-surface buoy string, was to be located within 50 feet of its position coordinates in a water depth of approximately 2,600 feet.

In addition, its sensor was to be plus or minus 10 feet of a prescribed depth. All three shallow water sensor systems were to be bottom mounted and precisely oriented and positioned. Effective performance of one system required its instrumentation to be leveled to with one-half degree of horizontal.

The basic construction system consisted of a YFU — the best available platform, upon which were mounted a fathometer for continuous monitoring of water depth, and a 25-ton crane and a tensioning winch for overboarding and lowering the various system components, respectively. CHESDIV FPO-1 engineers advised and assisted UCT-1 personnel with many of the topside operations, including the laying of five electromechanical submarine cables to their monitoring stations on the shore.

In water depths as great as 110 feet, divers of UCT-1 utilized their underwater construction skills and experience to precisely position, orient, and perform all the mechanical and electrical connections necessary to assemble the complete functioning sensor system.

This performance in support of *Project Classic Thicket* represents just one of the several accomplishments by the NAVFAC/NCF team this fiscal year as it continues to fulfill the Navy's role as a leader in ocean facility construction.

CBC Davisville to Assume Logistics Role Sans Seabees

• Alexandria, Va.

In keeping with the Navy's effort to realign the naval shore establishment, the mission of the U. S. Naval Construction Battalion Center, Davisville, R. I. is to be reduced. The action is part of the overall Navy effort to consolidate fleet units and shore activities and to provide for more efficient operation, with reduced expenditure.

The reduction of the naval mobile construction batatlions from 21 at the height of the Southeast Asia conflict to 10 at present, the current support operations at CBC Davisville are no longer required.

At the peak of the Vietnamese conflict, Davisville supported seven overstrength battalions. It is now the permanent duty station for Naval Mobile Construction Battalions 1, 40 and 71, and headquarters for Commander, Naval Construction Battalions, Atlantic; Commander, Naval Support Force, Antarctica; and the location for Naval Schools, Construction.

As a result of the planned action, NMCB 1 and 71 will relocate to the Naval Construction Battalion Center, Gulfport, Miss.; NMCB 40 and Commander, Naval Support Force, Antarctica will go to the Naval Construction Battalion Center, Port Hueneme, Calif.; Commander, Naval Construction Battalions, Atlantic will be located at Norfolk, Va.

NAVSCON and 21st Naval Construction Regiment will be disestablished.

The future mission of CBC Davisville will be that of providing storage and preservation facilities for advanced bases and mobilization stocks; to provide mobilization facilities to support the Naval Construction Force — the Seabees — and, to perform additional tasks as assigned It is planned that actions associated with achieving this new mission status will be completed in June 1975.

The Davisville Construction Battalion Center was established in 1951 for the support of overseas naval bases. Throughout its history, the base has been associated with the training and assembling of personnel and material for the construction of Navy and Marine Corps bases at overseas locations in the Atlantic, Mediterranean and Caribbean areas.

New NAVFAC Pollution Control Standards Reconciled with Federal/State Levels

By LAJOS M. WERNIGG and GEORGE C. WHITE
Civil Engineering Branch
• Alexandria, Va.

The recently completed update of the pollution control section in Design Manual 5, incorporates the latest technology and brings NAVFAC standards abreast of federal and state requirements for pollution control. The update was accomplished by contract with consultants in the field of water, sewage and industrial waste treatment. Work began in March 1971 and required a complete restudy of NAVFAC's criteria and 21 existing definitive drawings.

The scope of the work required study and updating of all phases of collection and treatment of liquid wastes, i.e., domestic sewage, industrial waste and oily waste from shore based facilities. New procedures covering the transfer and treatment of ship's salt-water carried sewage and hotel wastes, industrial wastes, and bilge and ballast wastes were added to the design manual.

An advance copy of the criteria and definitive drawings relating to the transfer of ship's waste water was issued in February 1972 to meet urgent need for guidance in the design of wastewater collection systems on piers. This advance issue provided information on generation and pumping rates of sewage for various types of ships, and provided guidance in the design of manifolds, pipe lines and pumping stations in pier collection systems.

In November 1972, the contract was completed and the final draft of the criteria and the revised definitive drawings were accepted. An advance copy of both was forwarded to all NAVFAC field divisions. The final submittal is now being prepared for reproduction. Full issue of the new criteria and definitives will be made upon receipt of the material from the printer. In the interim, NAVFAC field engineering offices have the benefit of up-to-date criteria and definitives as guidance in the solution of the Navy's liquid waste pollution problem.

NAVFAC Updating Sanitary Landfill Criteria

By L. M. WERNIGG
Civil Engineering Specialist
• Alexandria, Va.

To protect and preserve the environment, the navy needs the most up-to-date pollution abatement criteria. Therefore, NAVFAC is updating sanitary landfill criteria to ensure that the utilization of disposal sites meet all applicable health and environmental standards.

A sanitary landfill is a disposal site employing an engineered method of disposing of solid wastes on land in a manner that minimizes environmental hazards. This is accomplished by spreading and compacting the waste in thin layers and applying cover material at the end of each operating day. Solid waste may include garbage, refuse, sludges, and other discarded materials resulting from industrial, commercial and agricultural operations and from community activities.

A properly located, designed, and operated sanitary landfill should minimize the following environmental hazzards:

- Groundwater pollution by leachate (liquid that has percolated through solid waste and has extracted dissolved and/or suspended materials from it). Methods used may include staying above maximum ground water table, providing impermeable layer below solid waste cells, and collection and treatment of leachate.
- Gases generated in landfill: biological degradation of organics in solid waste results in gas generation which can become an explosive mixture and a potential groundwater pollutant. Control procedures include venting of gases through the top of landfill and placement of permeable and impermeable layers to stop lateral migration of gases.
- Rodents, insects and birds: compaction and frequent covering of waste are effective control methods. Shredding and/or milling of waste may eliminate this problem if the additional cost of such processing can be justified.
- Blowing paper: control measures include planting of tall trees to minimize the wind speed across the fill, minimizing and aligning the working face with prevailing wind direction and providing both permanent and portable fencing.

Planting of vegetation on the completed sanitary landfill will minimize erosion and will provide usable land area for recreation and sports. Provisions for future monitoring of the site, using gas concentration probes, groundwater sample probes and subsidence benchmarks, will provide advance warning of possible hazards.

Performance Specifications Defined

By RICHARD H. WELLES
Specifications and Costs Division Director
• Alexandria, Va.

In the early days of railroad construction, a prospective contractor was given a location and requirements to build a bridge to carry a stated load and to test the finished bridge with that load. This was a "true performance specification." There was no mention of materials.

However, if the requirement had been placed upon the contractor to build a *steel* bridge it would no longer be a true performance specification.

Most specifications today are a combination of performance and prescriptive requirements which limit the material selection and state the performance characteristics of the permitted materials.

Probably the biggest problem involved in performance specifications is in devising test methods that will assure adequate performance over the useful life of the required item. Test equipment on some items is just not available, or else it is available in such limited quantities or locations that it is impractical or uneconomical to use. Because of this, warrantees or guarantees have been substituted to assure quality. For items that are expected to give service for many years, there are obvious drawbacks to this procedure.

It is also very difficult to specify characteristics pertaining to operating, repairing and servicing certain items in performance terms but despite this, performance specifications have application and advantage for items that are pushing the state-of-the-art or where innovations are invited. They have proven particularly useful in factory-fabricated building systems.

NAVAL CONSTRUCTION FORCE REVIEW

By CDR D. L. CONNER, CEC, USN
Director, Seabee Division

Command changes and the announcement of FY-73 "Best of Type" awards highlighted recent Seabee history.

July 31, 1973 tops the calendar list of changes of command in the Naval Construction Force. On that date Rear Admiral John R. Fisher assumed command of Pacific Fleet Seabees from Rear Admiral Donald G. Iselin, who then departed Pearl Harbor to take over his new responsibilities as Vice Commander, Naval Facilities Engineering Command.

At Davisville, R. I., Capt. Paul R. Gates assumed command of the 21st Naval Construction Regiment from Capt. Warren G. Stevens while, down in Gulfport, Miss. Capt. William M. Zobel relinquished command of the 20th NCR to Capt. Ward W. deGroot III.

Meanwhile, in the NCF units, several command turnovers earned space in the monthly Operations Reports. Cdr William N. Ahrens accepted the helm of Coronado-based PHIBCBONE from Cdr Matt C. Miekush. Cdr John A Westcott assumed command of NMCB 3 from Cdr Lee Smith at Port Hueneme, Calif. and, on Okinawa, Cdr Ralph W. Auerbach relieved Cdr Robert J. McHugh in NMCB 5. Cdr John M. Weis turned over NMCB 10, then on deployment to Puerto Rico, to Cdr Thomas F. Stallman and in NMCB 133, Cdr William C. Connor was relieved by Cdr Leland R. Dobler just after the battalion returned to Gulfport from Rota, Spain. The command of Construction Battalion Maintenance Unit 302 also changed hands when Lt James W. MacLaughlin relieved Lt Walter W. Tomiak at Subic Bay.

The Atlantic and Pacific NMCBs "Best of Type" announcements have been made. In the Pacific Force, Cdr John M. Weis led NMCB 10 to the award for FY-73 by its outstanding performance during homeport training assignments and its superior command management of the main body and numerous detachments while deployed.

The top Atlantic spot went to NMCB 74, under the command of Cdr James D. Kirkpatrick and, later Cdr James E. Bodamer, for outstanding homeport and deployed periods, including construction of a hospital barge for the Bolivian Navy on the shores of Lake Titicaca, located at 13,000 feet of altitude in the Andes.

The Reserve Naval Construction Force, under the leadership of their new First Brigade Commander, Rear Admiral Philip V. King, CEC, USNR-R, is actively engaged in planning FY-74 Readiness Duty Training. Detailed planning for this year's deployments of the 18 RNMCBs was set in Gulfport in September when Rear Admiral King and his regimental commanders laid the foundations for FY-74 training. This year RNMCB deployment planning encompasses both Camps Pendleton and Lejeune, as well as Puerto Rico and even Alaska.

Construction Battalion Units continue to spearhead the Navy's Self-Help Program. The 17 CBUs have been averaging between $250,000 and $300,000 worth of construction materials in place every month and the chart of Self-Help effort is equally impressive: nearly 6,000 mandays of support every month from non-Seabee enlisted ratings assisting in the construction or renovation of personnel support facilities.

The PHIBCBs have recently suffered losses of men experienced in causeway operations. Since it takes several months to train a man in safe and proper handling of pontoon causeways, the PHIBCBs have been busily engaged in operational training exercises, including assisting in training midshipmen from the Naval Academy on amphibious warfare exercises.

Seabees are now once again deployed around most of the world. With NMCB-71 on the "Ice" for their third deployment to Antarctica, NMCBs and their detachments now span 230° of latitude, both north and south of the Equator, and 315° of longitude!

Six Seabee Rates Listed in New DPPO Drive

By LT R. P. ANGELELLI, CEC, USN
• Alexandria, Va.

A vital concern of the Navy, particularly the NCF, is the shortage of petty officers. Within the Seabee community, some petty officer rates are less than 50% manned. This shortage has had detrimental effects on the traditional NCF standards of leadership and performance.

To help reduce this shortage, a new recruiting program for direct procurement petty officers (DPPO) now exists for selected Navy rates where the manning levels are extremely low. Rates from six of the seven Seabee ratings are among those selected; specifically, the first, second and third class petty officer levels in the engineering aide (EA), builders (BU), steelworkers (SW), construction equipmentmen (CE) and utilitiesmen (UT) ratings. These rates will remain eligible for the DPPO program as long as they are extremely undermanned.

The new program differs from the 1969 Seabee DPPO Program in terms of enlistment, qualifications and training. The new program provides for the enlistment in the regular Navy for four years. The applicant must be between the ages of 21 and 32, but a minimum age exists for each pay grade — for example, 21 for PO3, 23 for PO2 and 26 for PO1.

To be eligible for a particular rate, an applicant must possess the required knowledge and skills and show evidence of the civilian work and training necessary to meet specific requirements of the pay grade for which he was recruited.

For example, an applicant for BU2 must possess the abilities and knowledge required by the occupational standards contained in the record of practical factors and must have 48 months of work experience, half of which was training. However, if an applicant had prior military service and obtained his skill via service training, he would not be eligible under the program.

Minimum training is scheduled for the DPPO recruit under the new program. If he has less than six months prior military service, he is ordered to "boot camp" and then on to his first duty station as a petty officer. Those with six or more months of prior military service would be enlisted in the rating and pay grade to which they were recruited and then be made available for immediate assignment with no training.

The Chief of Civil Engineers has asked the EFD commands to offer the assistance of their officers with Seabee experience to local recruiters in the interviewing of Seabee applicants under the DPPO Program. This, coupled with the authority vested in the enlisted rating coordinator to give final approval of all applicants, will help to obtain only the most-qualified people.

Seabee Retention Study Group Submits Proposals to CNO

By CUCM OMAR WELBORN
Seabee Senior Enlisted Advisor
• Alexandria, Va.

Retention Study Groups (RSG) rank high among the Chief of Naval Operations' many avenues of exploration for ways and means of improving Navy life for enlisted personnel.

RSGs have been convened progressively since early 1970. The ultimate goal of the RSG concept is the retention of men and women of demonstrated quality performance for service careers.

In July, the 36th study group convened at the Bureau of Naval Personnel. The subject was Seabee retention.

Members of the 13-man Seabee Retention Study Group represented Seabee commands in the Atlantic and Pacific Fleet and the continental United States. Both career Navy men and first termers were present to ensure a broad spectrum of constructive ideas. Seven men were first-termers, one had broken service, and one man was a directly procured petty officer. The senior enlisted man was EQCM Bob Cole from NAVSCON, Port Hueneme, who subsequently presented the group's report to Admiral Zumwalt and to representatives of the Chief of Naval Personnel. Guidance was provided by LCDR W. J. Flanagan, a CNO Fellow.

Several areas for improvement of Seabee life and service were singled out. These ranged from stronger leadership and less family separation, to better oriented training and retention incentives for second-termers. Clearly not a self-serving group, the topics they developed were directed at the overall betterment of Seabee service in the Navy and improved mission accomplishment.

When the Seabees made their presentation to CNO and his deputies at the Pentagon, it was well received. Several of the major topics were promptly staffed. The results of staff study and final determination of the status of the recommendations are expected to be published within the near future.

EQCM Johnny R. McCully Named Seabee Senior Enlisted Advisor . . .

By CUCM OMAR WELBORN
Seabee Senior Enlisted Advisor
• Alexandria, Va.

Master Chief Equipmentman Johnny R. McCully, USN, is the new Seabee Senior Enlisted Advisor to the Commander, Naval Facilities Engineering Command and Chief of Civil Engineers.

He has relieved Master Chief Constructionman Omar K. Welborn, USN, who served as advisor since January 1971. Master Chief Welborn left the headquarters command in October for duty in Taipei, Taiwan.

Master Chief McCully was born in Hennessey, Okla. 13 August 1930, and entered the Navy in 1947. One of the highlights of his career was as assistant officer-in-charge of Seabee Team 1104 in Vietnam. For his heroism during the Battle of Dong Xoai, Republic of Vietnam, in June 1965, Master Chief McCully was awarded the Silver Star and the Purple Heart. He has also been awarded the Bronze Star with Combat V, two Navy Commendation Medals, and the Navy Achievement Medal.

Master Chief McCully served as the assistant officer in charge of Naval Construction Battalion Unit 406 at the U.S. Naval Air Station, Lemoore, California, prior to reporting to headquarters.

Professional Development

Professional Registration Enhances CEC Officers' Careers

By LT G. F. EVERHART
Education/Training Branch, CEC Officer Plans, Policy Education and Training Division
• Alexandria, Va.

Most CEC officers who have been in the corps for more than a few months are well aware of the emphasis placed on professional registration by the Chief of Civil Engineers. Numerous official directives describe programs available to officers and civilian employees alike to assist in obtaining refresher instruction and arranging to take the registration examination.

Registration as a professional engineer or professional architect is clearly considered to be an important milestone in the professional development of both CEC officers and NAVFAC civilians.

But aside from the obvious self-satisfaction associated with successful completion of the registration process and membership in a recognized profession, how can registration, or the lack thereof, affect an officer's future in the corps?

NAVFAC policy consistently supports the need for registration in several important ways. For example, professional registration is a factor to be considered in recommending the assignment of officers to key billets. Similarly, certain activities will be restricted to those officers who are registered. Included are the following: representation of the Command in a consultive capacity; attendance at NAVFAC sponsored engineering or architectural conferences; attendance as a NAVFAC representative at professional meetings; serving on A&E selection boards, fee negotiation boards, contract claim or change order boards; and signing of documents dealing with engineering and architectural decisions.

Registration can also become an indirect factor in promotion board considerations, particularly for the increasingly competitive senior grades.

In addition to the impact upon individual CEC officers, registration serves to maintain the high level of confidence and esteem attributed to the Civil Engineer Corps by Navy and Defense Department seniors, as well as other government and non-government organizations. By pursuing the registration goal each officer is helping himself and the CEC.

Navy Real Property Inventory . . .

. . . You can believe it

. . . mainly

By R. K. VOLK, JR.
Systems Analysis Division, NAVFAC
• Alexandria, Va.

The question is often asked, *"How reliable is the Navy Real Property Inventory?"* The answers are usually as varied as the individuals who are queried; ranging from *"okay,"* or *"it's no good"* to *"I never use it!"* The general consensus was that even knowledgeable personnel were skeptical of RPI reliability due to varied experiences while attempting to utilize the inventory data.

In June 1973, the Real Estate and Facilities Planning functions were merged at NAVFAC headquarters, and the Systems Analysis Division performed an independent analysis of the statistical credibility of the Real Property Inventory.

Accordingly, a mathematical sample was devised against the total RPI file of 181,400 records. A sample of 400 records was deemed necessary to return a reliability of 95% with limits of plus or minus 5%. Four hundred random numbers were selected through a computer program at FACSO, Port Hueneme, where the RPI record is stored on computer disc files.

The random numbers were accessed against the RPI computer disc files and the sample of property records was sent to NAVFAC for the analysis. The sample contained a broad spectrum of Class 1 (land only), Class 2 (buildings, structures and utilities), and outgrant records for all six engineering field divisions. It was determined through discussions with facilities planning and real estate personnel that 29 of the total of 77 records would be defined as critical indicator elements.

The credibility study was then conducted by telephone directly with the public works officers at the activities involved. All EFD headquarters offices were also notified.

The activities were asked to physically inspect the property to verify information shown on the record. All data elements were to be checked and any discrepancies were to be reported back to the NAVFAC study control center. A total of 144 activities out of 840 activties (17.1%) in the Navy Facilities Assets file were sampled.

The results of the study were significant: there was an average of 1.2 errors per card, which represents about a 5% error rate. The majority of errors found were in two of the data elements: *DE 304,* representing the total area, and *DE 511,* representing the sum of the areas including all users and uses of the property. The error severity rate for DE 304 was 268/1000 and DE 511 was 273/1000.

In addition, it was found that confusion existed in the field over the definition and usage of these data elements. A need was also indicated for a deficiency code that would identify the severity of substandard versus adequate criteria in the 500 series elements.

A major goal will be to reduce the error severity rate in the highlighted areas; however, the analysis demonstrated that the overall credibility of the RPI is quite favorable. The reporting activities that were contacted are to be commended for their support.

Seven Years' Dry Spell Ends for "Inadequate Quarters" Designations

By NORMAN C. BEARDEN
Program Analysis and Evaluation
• Alexandria, Va.

It takes an Act of Congress before public quarters can be declared inadequate for rental basis and, as a result, many Naval housing units are classified as adequate with occupants forfeiting their full Basic Allowance for Quarters (BAQ). These quarters are seriously deficient in size, condition, and amenities when compared to the new construction criteria and to community housing available to persons of comparable income.

In the early post-Korean War period the armed services were given authority by Congress to declare certain quarters inadequate.

The Navy Family Housing Inventory presently contains approximately 5,000 inadequate quarters so designated under this authorization which expired in July 1965. For the last seven years declaration of additional quarters as inadequate has not been authorized.

In November 1971, the Office of the Secretary of Defense directed a survey of the existing family housing inventory to determine the number of units considered inadequate by the services.

Using standards furnished by OSD, it was determined that of the Navy total of about 68,000 public quarters, approximately 18,500 were considered inadequate by the installations conducting the survey.

On October 25, 1972, P. L. 92-545, 92nd Congress, authorized the Department of Defense to designate 20,000 family housing units as inadequate. The Department of the Navy allocation was 6,683, with sub-allocation of 4,163 to the Navy and 2,520 to the Marine Corps.

In view of the limited authorization, a complete review of the 18,500 units nominated was necessary before final selection could be made. In addition to the OSD criteria, the review considered recent shore establishment realignment actions, relative long-term requirements, susceptibility to improvement and availability of funds to accomplish necessary upgrading.

Results of the review were provided to cognizant commands by a message of 26 June 1973 from the Chief of Naval Operations (CNO). A subsequent message of 14 August 1973 made minor revision to accommodate changed conditions at selected field activities and, at that time, the selection became final with no other changes possible.

The Navy list was provided to OSD and the designation of 4,163 units became effective 1 July 1973.

Occupancy of inadequate quarters is voluntary and military personnel forfeit the appraised rent and charges or 75% of BAQ, whichever is lesser; except, that in no case will the income to the Government from forfeiture be less than the cost of operation and maintenance of the unit. When operation and maintenance costs exceed 75% of BAQ, additional forfeiture is required to recover costs, up to a maximum of full BAQ. Inadequate quarters must be disposed of if costs exceed full BAQ.

It will take another Act of Congress before additional quarters can be declared inadequate as the present authority expired with the designations of 1 July 1973.

Multi-Year Information System Spotlights Hot Projects

By CDR T. P. SCHURR, CEC, USN

• Alexandria, Va.

The management information system for supporting program/budget development and maintenance of military construction was initiated in August 1968. System objectives were oriented to decision-makers with a responsive system, sensitive to the problem of the allocation of funds within each budget year, as well as for mid and long range plans.

The output of the shore installation planning system, deficiency identification, is the input to the programming system. There is a current backlog of facility deficiencies of about 6,000 line items, valued at approximately 6 billion, identified in the Military Construction Program Objectives (PO) data bank.

The programming system, including procedures, personnel, data and equipment is used to develop budgets and programs from the PO data bank. It includes the use of automatic data processing both as a clerical and an analytical aid. System design includes consideration of facility types, budget submission cycles, fiscal guidance, and the goals and objectives of the Chief of Naval Operations and the major commands.

The heart of the system is the ability to provide consideration of specific investment plans, such as, the shipyard modernization program; the general investment requirements related to a large property inventory; and the urgent needs of the major commands.

The funding needs of the specific investment programs are set aside first. Then the remaining funds are allocated for acquisition of various types of facilities on the basis of the percent of identified deficiencies and the age of existing facilities in the real property inventory of that type. The funds allocated for acquisition of a particular type of facilities are further allocated to major commands with deficiencies of that type facilities by use of the Item Rating Value System (IRV).

The IRV is a method of establishing priorities among all the deficiencies of each facility type of the various commands. Finally, the specific projects to be acquired by the funds allocated according to facility type and major command sponsorship are determined by the project priority assigned by the major command.

The programming system is updated continuously. Data may be changed at any time and report schedules are flexible so that information may be distributed whenever the need arises. A large variety of reports are available to satisfy the information of all command levels.

The programming system supports managers from the activity level through the entire chain of command to the Chief of Naval Operations. The reports distributed convey the official program/budget to each level of management. Consequently, each manager can use the information to control his own management actions. For example, manpower can be directed to developing the documentation for those projects which are going to be in a budget submission without wasting time on projects which will not be included.

On the other hand, if a vital project has been excluded from a budget then action can be taken to ensure its inclusion. Such a system enables the manager to focus his efforts directly on the problems without wasted effort on those issues which are routine.

The Military Construction Programming Division of the Naval Facilities Engineering Command operates the programming system for the Chief of Naval Operations.

PWC San Francisco Debut Slated for July 1974

• Washington, D.C.

To improve public works services to the Navy and other military commands and consolidate like functions in the San Francisco area, the Chief of Naval Operations has directed the Chief of Naval Material to establish a new Navy Public Works Center in the Bay City area.

Responsibility for the planning, implementation and follow-up required to establish PWC San Francisco has been assigned to the Naval Facilities Engineering Command, with an operational target date set for July 1, 1974.

NAVFAC's on-site representative, the commanding officer, Western Division, Naval Facilities Engineering Command, will coordinate the local actions required to implement the schedule.

Specialists in PWC operations, systems and procedures met at WESTDIV August 6-17 to make detailed plans and establish tasks, manpower estimates and a PERT network to accomplish the consolidation. The group consisted of representatives from headquarters, WESTDIV and existing PWCs as well as representatives from the activities to be served: Naval Station, Treasure Island; Naval Supply Center, Oakland; Naval Air Station, Alameda; Naval Hospital, Oakland, and the U. S. Army Base, Oakland.

The inclusion of an Army activity marks the first PWC consolidation effort that has consisted of other than Navy shore activities. This consolidation was initiated as a result of a recommendation made to the Secretary of Defense by the Real Property Maintenance Consolidation Committee in San Francisco, chaired by the Army.

Building a Nest

Surface

Architect's rendering of test facility at NAS/NATC Patuxent.

• Patuxent, Md.

Completion of the surface-effect-ship (SES) test facility, located at the Naval Air Station/Naval Air Test Center, Patuxent River, Md., marks yet another Civil Engineer Corps accomplishment.

The $1,854,910 contract for the SESTF complex was awarded by the Chesapeake Division of the Naval Facilities Engineering Command in June 1972.

The Navy's 100-ton surface effect ship program began in early 1969 with the award of contracts for the design, construction and testing of two surface effect ships.

The present SES program is the initial phase in the Navy's long range goal to provide a more mobile and effective surface fleet capability. The program objective is to determine the feasibility of construction and operation of a fleet of large, high speed, surface effect ships of the 4,000 to 5,000 ton class capable of speed in excess of 100 knots.

The Navy's coordinating office, the Surface Effect Ship Project Office, SESPO, has designated the vessels *SES-100A* and *SES-100B*. The *SES-100B* rides on a drag reducing air cushion contained by a catamaran-principle hull and flexible bow and stern seals.

The 77 ft. x 35 ft. aluminum craft uses a lift fan system to generate the air cushion.

Propulsion is provided by three 4500 hp marine gas turbine engines which drive two semi-submerged, super-cavitating propellers.

During operation, the craft skims the surface, riding on the generated air cushion with only the lower portion of the catamaran hull in contact with the water surface.

The 80 ft. x 38 ft. *SES-100A* is propelled by two water-jet pumps powered by four 3,500 hp marine gas turbine engines.

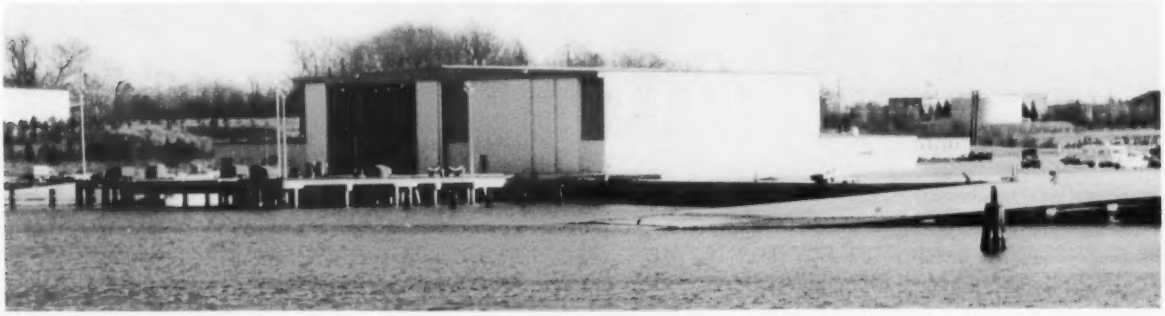
A lift fan system is used to generate and maintain the air cushion. The *SES-100A* glides across the water on its air cushion creating the illusion that it is flying.

During the design phase for the test facility, which commenced in June 1971, the architect/engineer and the Navy overcame problems involving selection of the hoisting mechanism, conversion of the existing aircraft parking apron and the seaplane basin to a suitable site for the complex, selection of pier type and determination of the building complex type.

Several methods of removing the crafts from water to shore were considered. These included a marine railway, bridge crane system, dual marine railways, marine railway with vertical curves, floating dry dock systems, Syncrolift with a boathouse constructed over the water, and Syncrolift system with pier.

Considerations involved in the final selection of the removal system included cost, efficiency, personal safety, availability in the required time frame, and boat handling safety characteristics.

Based on these considerations, the Syncrolift system with pier was selected. Syncrolift is the trade name for

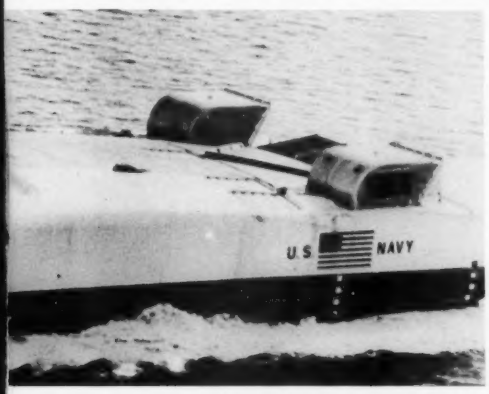


SES Test Facility offers full range of accommodations including synchronized lift system for drydocking.

for Navy's SES

Effect Ship Test Facility Completed

By LT T. L. RUGUELET, CEC, USN
Assistant Resident Officer in Charge of Construction NAS, Patuxent River, Md.



a vessel-lifting pier system operated by an electronically synchronized weight distribution system. The system employs four synchronized hoists. It has a rated capacity of 195 long tons with a maximum lifting capacity of 250 long tons when evenly distributed on all hoists.

The World War II concrete aircraft parking apron selected as the site for the complex showed signs of settlement in excess of two feet which had left the apron in a tilted position. Investigation revealed that the apron area had been constucted on a stream bed. As a result, design was based on using a lightweight slag fill in lieu of other commonly used and denser fill materials to level the apron. This method allowed a maximum of 2,000 psf building pressure and will reduce future settlement.

Design of the Syncrolift system and the characteristics of the crafts dictated that the seaplane basin have a minimum 26-foot depth at the pier and a minimum 15 foot depth at other points. To fulfill this requirement, 30,000 cy of silty-sand had to be dredged and relocated. In conjunction with the U.S. Army Corps of Engineers, an inland pond located approximately 3,000 feet from the dredging area was selected as the disposal area. The disposal material was to be deposited at the upstream section of the pond and the silty material allowed to distribute over the pond bottom.

A concrete pier was selected to allow for long term future use of the Syncrolift mechanism and pier. Class V cement was specified to counteract salt water deterioration of the piling. Semi-permanent pre-engineered metal buildings were selected for the building complex in lieu of more temporary structures to allow use of the facility for future test programs.

The SESTF complex includes a 42,000 sf pre-engineered metal building with reinforced concrete foundations and floors, structural steel bents, baked enamel metal sidings, aluminum roofing, interior and exterior masonry walls.

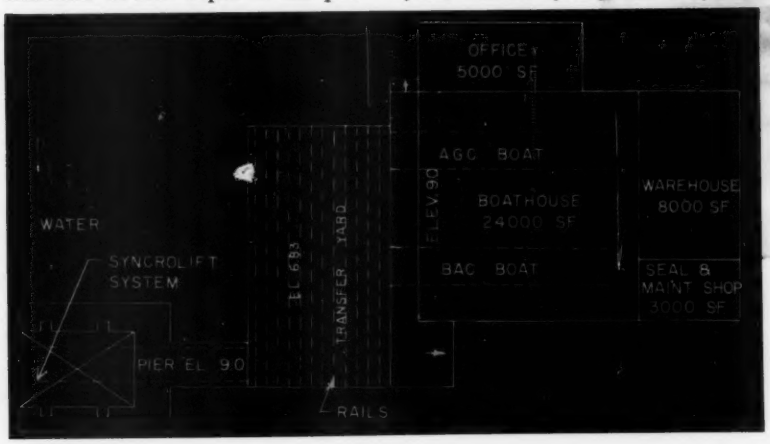
The building provides boathouse space for the crafts, warehouse, seal and maintenance shops, administrative offices, instrumentation room and connecting utilities. The building varies in height from 14 ft. at the office area to 40 ft. at the boathouse proper.

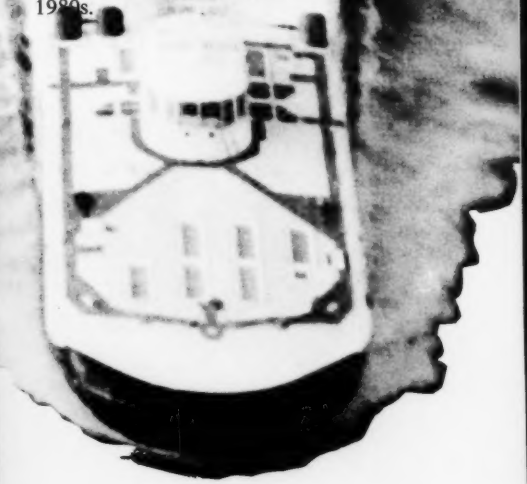
The complex includes a transfer yard, transfer system, and a Syncrolift system with pier capable of raising the 100-ton ships at a one-foot per minute rate. The building complex slab and transfer yard are constructed over 3,000 tons of slag fill. The pier was constructed using 54 prestressed concrete piles approximately 80 feet long.

Precast concrete plank with a two-inch concrete topping were used to deck the approach and sides of the pier. The transfer system includes a separate steel cradle for each craft, a steel transfer car and rail system.

The transfer operation begins with the ship being raised from the water by the Syncrolift system on the steel life platform and cradle car. Once the vessel has been raised to pier level, the Syncrolift automatically shuts off. The vessel and cradle car are then hauled off the pier via the rail system onto the transfer car, laterally transported across the transfer yard, and aligned with the boathouse rails. The craft and cradle car are then hauled into the boathouse for maintenance and repairs.

Should the testing and evaluation of these Surface Effect Ships prove fruitful, the Navy will perhaps be a few steps closer to meeting the challenges of the seagoing fleet of the 1980s.





Advice of Counsel

Fulfilling Contract Obligations

By WILLIAM H. SPECK
Counsel, NAVFAC

"The prophecies of what the courts will do in fact, and nothing more pretentious, are what I mean by the law."
— Justice O. W. Holmes

• Alexandria, Va.

A government contractor must furnish what the specifications provide or the plans indicate, regardless of how rightly he may demonstrate that the government should be satisfied with something different or less.

And conversely, the government may demand only what the specifications and plans require, regardless of their unexpressed intent. Opening specifications paragraphs declaring the intent to provide a facility complete and ready for use add almost nothing to the work the government may demand.

General Provision 2, that anything mentioned in the specifications but not shown on the drawings, or vice versa, has the same effect as if required by both. Drawings should show what work the contractor must do, and specifications should tell how (materials, tests, etc.) But the distinction is not precise, and the government contract need speak only once.

General Provision 70(b) requiring contractors to perform work omitted or misdescribed but "manifestly necessary to carry out the intent of the drawings and specifications" does require additional work beyond that expressly stated, but not too much additional.

In *Ruscon Construction Co.*, ASBCA 17867, the contractor had to tie new beams to existing joists and the work manifestly required cutting and patching existing concrete. A contractor required to lower a hung ceiling must also lower the exhaust vents in that ceiling. (*R. B. Construction*, ASBCA 17154, 73-1).

General Provision 9 requires equipment and material to be "new and of the most suitable grade" and "work (to) be performed in a skillful and workmanlike manner." In *Essex Electro Engineers, Inc.*, ASBCA 15967, good design and workmanship precluded a threaded rod, which caught dirt, caused wear, and was weakened by the threads. Good design also precluded taping to insulate cable, but other imposed requirements were beyond the contractor's obligations.

Performance specifications oblige the contractor to furnish whatever detailed design is necessary to achieve the required performance. But the required performance must be achievable and be consistent with any design or other (e.g., standard product) clauses in the specification. Combinations of performance and design specifications may prove to be uncreatable monsters.

In result,only a few obligations beyond those expressly set forth in the specifications or indicated on the drawings may be imposed upon contractors.

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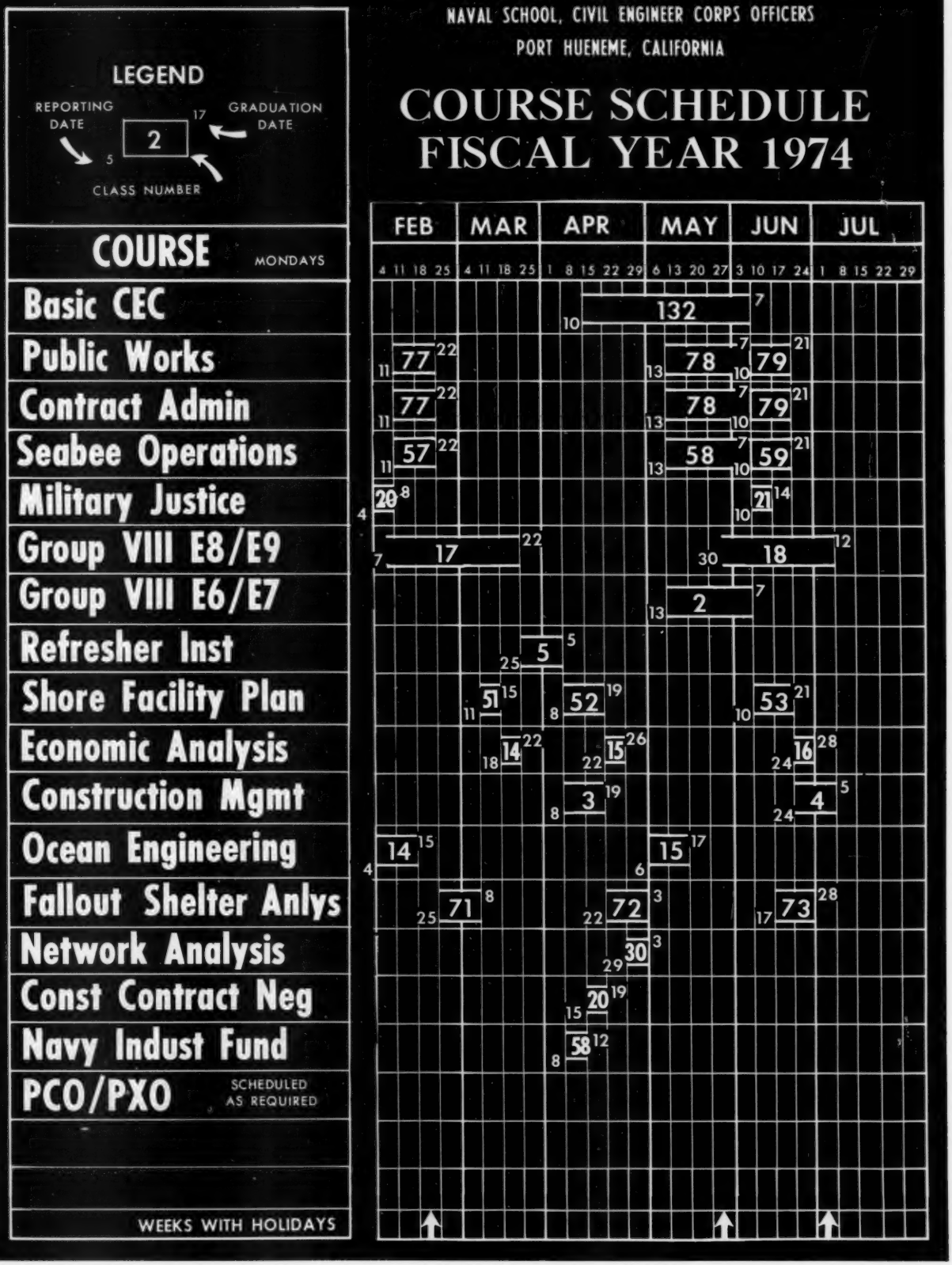
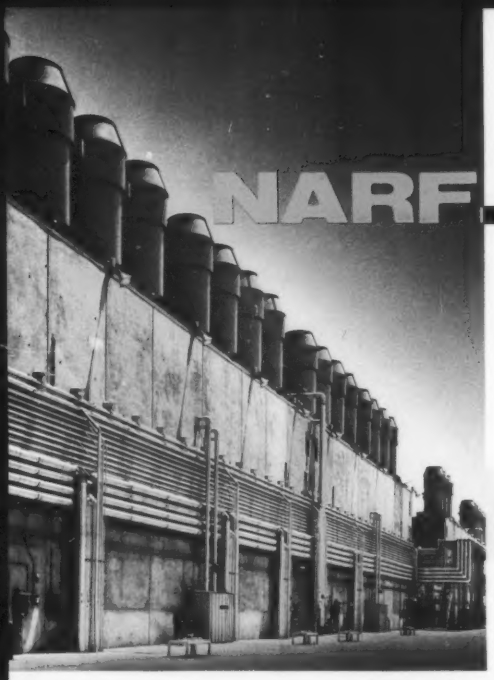


NARF.....Big Business in

By LT. JAMES W. OWEN, II, CEC, USN
AROICC, San Diego Area



Exterior of one of two painting buildings of the aircraft surface treatment facility shows complex of process piping and exhaust assemblies.

• San Diego, Calif.

NARF, the Naval Air Rework Facility located aboard the Naval Air Station, North Island, is a big business rivaling local aviation and aerospace firms. Their job is to overhaul and prolong the life of F-4, F-8, S-2 and E-2 aircraft; H-46 and H-53 helicopters; and J-57 and J-79 engines. In this task, NARF employs 7,230 civilians and 36 military in 1,978,240 square feet of structures plus 12,963,-456 square feet of open work areas. They service over 130 F-4, 40 F-8 and 35 E-2 aircraft; and 70 H-46 and 50 H-53 helicopters per year.

Providing facilities to carry on these tasks has also meant big business for the Resident Officer in Charge of Construction, San Diego area. Over $24 million has been spent in the past two years for three new facilities, and the program continues.

Avionics Facility

The first major new construction for NARF in several years, the $3,983,-062 avionics facility was begun in July 1969 and completed in April 1971. The 120,000 square foot single-story structure is fully air conditioned and includes a small computer-controlled materials handling system used for repair and overhaul of sophisticated aircraft and helo avionics equipment.

A separate $41,000 contract was let for installation of cafeteria equipment which, when combined with government furnished equipment, provides a modern cafeteria capable of handling 600 people in three shifts, or about 150 persons per hour.

Another contract let in early 1973 for $276,000 will provide a weapons alignment shelter on the south end of the structure for full mission readiness preparation of the F-4 aircraft's radar.

Aircraft Surface Treatment Facility

The second of the new projects for NARF was the Surface Treatment Facility, one of the most sophisticated of its kind in the world. The $6,548,922 complex, started in August 1969 and completed in April 1971, is composed of five buildings totaling 84,000 square feet: an office structure, two stripping buildings and two painting buildings.

Personnel safety and environmental impact were major design considerations. Due to the volatile nature of chemicals and paints used in the operation, all electrical work is explosion-proof.

The air supply and exhaust systems are designed around a "four-phase" operation: cleaning, masking, painting and baking. The extensive system includes 40 roof top air intake assemblies, each consisting of intake fan, an auto-roll filter to remove airborne solids and a supply plenum system extending into the massive hangar doors through which the filtered air is passed in a laminar flow to circulate without turbulence across the painting cells. Each air intake unit produces 38,700 cfm of filtered fresh air. Spray operations are performed only when the hangar doors are closed, since the air inlet plenum is operational only at this time.

Discharge of the contaminated air from the resurfacing processes is accomplished by pulling the toxic spray-laden air through 40 auto-roll filters, then through ducts to the roof where 40 exhaust assemblies discharge the filtered air to atmosphere.

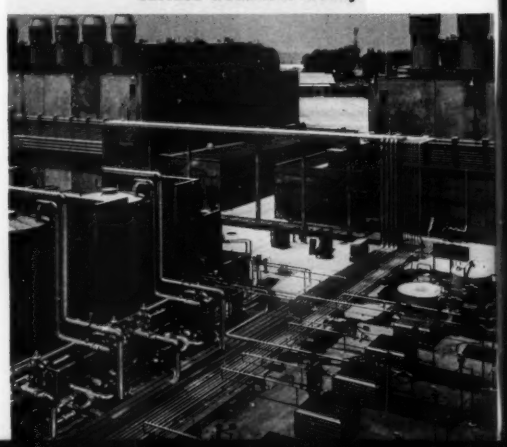
The auto-roll filters used in both air intake and discharge are designed with pressure differential sensing devices which automatically advance the filter media as it becomes saturated with impurities. The contaminated media is submerged in a water bath to reduce fire hazard.

The total ventilation system can handle 1,730,000 cfm. One system handles the corrosive fumes from the stripping operation, one handles those from the painting operation, and one provides air heated to 125° for drying by utilizing steam coils built into the supply network.

The process piping network handles 75 types of chemicals in over eight miles of copper, stainless steel and black iron pipe. Bulk chemicals are contained in seven stainless steel storage tanks — five underground and three on the surface — holding a total of 57,000 gallons of chemicals used in the stripping and painting cells. Many of these chemicals require constant circulation through the loop between tank and work area. Higher viscosity chemicals, such as epoxy stripper, must be heated to lower their viscosity to insure adequate flow in the pipes.

Water pipes embedded in the floors of the stripping cells provide continuous water for flushing during stripping operations. All wastes are collected in a central degritter system which

Intricate chemical and liquid handling network and storage tanks for aircraft surface treatment facility.



San Diego

Construction Boom Continues at NAS North Island

Some of the 98 plating tanks used for copper, chrome, silver, nickel, cadmium and tin plating in the Aircraft Accessories Overhaul shop. Environmental protection is stressed here, with complex recovery and purification system.

pre-treats the effluent to remove heavy particulate material; surface-floating and removing paint flakes and oils prior to passing the effluent into the station's newly completed waste treatment plant. This pre-treatment delivers an effluent which the main station plant can in turn treat to an acceptable level for discharging into the San Diego sewer system. As a result, NAS, North Island, will soon be a zero polluter of the bay.

Aircraft Accessories Overhaul Shop

The aircraft accessories overhaul shop, a single-story structure of 411'x706' with over 285,000 square feet of usable space, is by far the largest and most complex facility ever completed for the Naval Air Rework Facility. Long span trusses, 125 feet long, provide the most clear floor space possible.

Designed by Danile, Mann, Johnson and Mendenhall of Los Angeles and constructed by G. L. Cory, Inc. of San Diego, this $13,394,904 project was started in September 1970 and completed October 3, 1972. The Associated Institute of Steel Construction presented DMJM with the 1972 National Architectural Award of Excellence for their design. Other honors included the Award of Merit from the Southern California AIA and the American Registered Architects Award.

The shop contains a highly-developed cleaning and plating operation with the latest safeguards to prevent environmental pollution. Forty tanks in the cleaning shop contain chemicals such as chromic and sulfuric acid, magnesium deoxide, epoxy and enamel strippers and trichloroethylene degreasers. Ninety-eight plating tanks are provided for plating chrome, copper, silver, nickel, cadmium and tin.

Cleaning operations are performed in 40 tanks handling powerful chemicals.

Both shops have fiberglass exhaust systems which collect and deliver the toxic fumes to fiberglass air-water fume scrubbers, where all acid and caustic residue is removed prior to exhausting to the atmosphere. An elaborate fiberglass-coated concrete trench network of pits in these shops collects all harmful floor waste material for transfer to the station industrial waste treatment system. An exception is in the chrome plating area, where a separate $170,000 contract is in progress to provide pre-treatment of the waste material from this operation to dispose of harmful residue such as chromic acid. Special handling is required here to prevent formation of deadly cyanide gases.

In another area of the accessories overhaul shop, an extensive spray painting operation is designed around protection of the environment. Six large exhaust fans located on the roof produce air which forces spray paint particles to a water wash system at the rear of the spray booth. All particles collected in the water are deposited in a tank, so only clean air is exhausted to the atmosphere.

A most important asset of the overhaul shop, and probably the heart of the operation, is the $2.5 million computer-controlled material handling system. Two computers, one operational and one for back-up, control four automated stacker cranes and 25 elevator stations. A continuous overhead conveyor system, with sealed-bearing rollers for noise control, loops the entire facility. The 25 elevator stations, with cathode ray tube data input stations, allow ground-level operators to automatically secure and send parts to any other shop in the building or return them to storage.

This material handling system enables precise, timely inventory control and the most efficient shop loading possible with minimum effort. Daily computer print-outs permit optimum management of the operation.

A complete metallurgical photographic laboratory, an environmentally-controlled machine shop, a non-destruct test area and a welding shop and heat treatment facility also contribute to the versatility of the shop.

Heavy parts handling is accomplished by two roof-mounted 4-ton, 360° motorized jib cranes; four 1-ton interior jib cranes; 41 air-operated monorail hoists, nine electric monorail hoists and 26 bridge cranes.

NARF's tremendous construction program continues. A $3 million power check unit is in the final stages of design and will soon be advertised. A contract for a quarter million dollar weapons alignment shelter was awarded in late February 1973. Master planning includes an E-2 hangar addition now in final design, two new test cells, an avionics addition, a ground support equipment facility and a helicopter blade shop.

NAVY CIVIL ENGINEER 1973 INDEX

This index of articles appearing in The Navy Civil Engineer in 1973 is published for reference purposes. The first section of the index is by edition with an alphabetic listing by author. The second section lists articles alphabetically under general categories with edition date and page number shown.

FIRST SECTION

Spring of 1973

BAZAK, Henry V. ..... Utilities Procurement
BILDEN, R. P., LCdr. ..... Mediterranean Facilities Studies
BOYLE, W. H. ..... Careers — Planned or Gambled?
ESSOGLOU, Milon ..... OSDOC II Exercises
EVERHART, George, Lt. ..... CEC Officers Postgraduate Program
FOWLER, G. E., LCdr. ..... Instant Communication Formula
GARDNER, Lindsay K. ..... Value Engineering Analysis
GEWIRTZ, Morris ..... A Vanishing Breed
HOWARD, William L. ..... Military Preference Housing
KELLEY, F. G., Cdr. ..... Reserve Readiness Advanced
KOSKI, A. E. ..... Navy Lodge Units Now In Use
LAKE, George, Cdr. ..... Project Manual For Cost Data
LANTERMAN, William G. ..... Real Property Inventory
LOWERY, Edward J., Jr., Lt. ..... The CEC College Program
MARTINELLI, S. A. ..... LANTDIV's New European Branch
MATTHEWS, W. G., LCdr. ..... Key Entry System for FACSO
MAYER, Robert H., Ens. ..... Azores Fixed Acoustic Range (AFAR)
NAVFAC Counsel Staff ..... Effects on Non-Compliance
OLSON, D. ..... RDT&E — Help In a Hurry
OLSON, D. ..... OSDOC II Exercises
PENSYL, J. D., Lcdr. ..... NMCB Status Report
SCHEETZ, R. E. ..... Containerization of Ordnance
SHACHMUT, Kenneth M., Ens. ..... Economic Analysis Course
SIMS, George L., Jr. ..... Armed Forces Pest Control Board
Staff of NCEL ..... Containership Offshore Offload Concepts
STER, John W., LCdr. ..... Azores Fixed Acoustic Range (AFAR)
STINSO, Richard ..... Ammo Pier Delay in Guam
STONE, Tom ..... Collection of Bilge Wastes
SWANSON, E. ..... Land Acquisition Policies
VELLA, Victor A. ..... FACSO Comes of Age
WALKER, Leslie ..... The Yards & Docks Annex
WATSON, James P., LCdr. ..... Blast Effects On Fish
YACHNIS, M. ..... Hyperbaric Design Manual
UNSIGNED ..... Change of Command
UNSIGNED ..... Marine Borer Named for Laboratory
UNSIGNED ..... Museum Solicits Mementos
UNSIGNED ..... NCEL Tests Power Monitor
UNSIGNED ..... NMCB-1 Wins Peltier Award
UNSIGNED ..... RPG Facility At Point Mugu
UNSIGNED ..... Seabees Aid Quake Cleanup
UNSIGNED ..... WESTDIV Wins Design Awards

Summer of 1973

BAER, George E. ..... NAVFAC Carpet Flammability Standards
BOOTHE, Allen, LCdr. ..... How to Brief — Briefly
BRAUN, Harold ..... Gulfport Seabees Aid Tornado Recovery
BRAUN, Harold ..... Seabees Build Floating Hospital in Bolivia
BRITTENBRING, C. ..... Dredging Goes Environmental
BURTON, J. T. ..... PacDiv on Line with FACSO
CERBONE, Daniel D. ..... Prototype for Marine Corps BEQ
CHANCE, Tom, JOC ..... Ens. Rigoulot Graduates From CECOS
COMPTON, C. A. ..... Developing A Cost/Benefits Model
COOPER, Terence ..... Gambusia Fish Quell Mosquitos
GOSGROVE, D. M., Lt. ..... Air Installation Compatible Use Zones
FERILLO, Traynor ..... SouDiv Nets Navy's Largest Timber Sale
GROFF, J. B., Cdr. ..... Planning the Pollution Battle
JOHNSON, C. C. ..... Energy Resources Group Established
JONES, Michael J. ..... Non-Destructive Pavement Tester Trials
LANE, Frank ..... Housing Management Information System
LEIGHTON, G. A. ..... Dredging Goes Environmental
LEONARD, Ross ..... Navy/Marine Conservation Awards
LEWIS, Louise ..... Co-op Administrative Work Study Program
MELTON, Howard C. ..... Preserving the Navy's Heritage
National Bureau of Standards ..... Disaster Mitigation Program
National Science Foundation ..... Earthquake Engineering Research
NICKERSON, H. D. ..... Tri-Service Seismic Design Manual
O'CONNOR, C. A. ..... Evaluating Medical Facility Construction
O'DONOGHUE, Roger ..... NAVFAC Cost-Cutters Sheepish
RAPPEL, Donald C. ..... Livestock Grazing on Boardman Range
RODGERS, John A. ..... Uninterruptible Power Systems
SMITH, Sherrill E. ..... Hospital Wastes Handling System
SUTTON, E. R. ..... Noise Study at Naval Underseas Center
TYRELL, J. V. ..... Tri-Service Seismic Design Manual
YANKOUPE, George W. ..... Modular BEQ's Reindeer Station
ZIMMER, Glen W. R. ..... Radiological Affairs Support Program
UNSIGNED ..... Command Changes at CBC Gulfport
UNSIGNED ..... Government Procurement Commission
UNSIGNED ..... Mobile Reservists Build Self-Help Hobby Shop
UNSIGNED ..... Seabee Reserve Command Changes
UNSIGNED ..... TACOSS Prototypes Demonstrated
UNSIGNED ..... Vehicle Storage Facility Opens

Fall of 1973

BRADD, Floyd, Jr. ..... Navy Houses Into Navy Homes
BRANNAN, Arthur, Jr. ..... Pesticide Disposal
BROWN, Harry J., Lt. ..... The Role of the Proponent in the NFS
CARR, Millard E., P. E. ..... Utilities Energy Conservation Program
CROWLEY, P. ..... Profile of NAVFAC's Engineers and Scientists
CROWSON, R. D., P. E. ..... Renewal of Pierside Electrical Services
DANO, John N. ..... Data Processing Trends
ESSOGLAU, Milon E. ..... Bargeships in Amphibious Logistics
GREENE, Eileen E. ..... 'Instant' Housing Referrals
HANSEN, A. J., P. E. ..... Renewal of Pierside Electrical Services
HARRISON, Lloyd, Jr., Lt. ..... Is It Time To Go — Underground?
KLOTE, John ..... Cryogenics Storage and Transfer Systems
KLOTE, John ..... Small Incinerator Technology
LONG, James D., RA ..... Plastics Labeled Hazardous
NADEAU, Paul F. ..... Oil Spill Recovery Tests in Boston Harbor
O'REILLY, Andrew J., Jr. ..... Construction Training By Army Engineers
PENSYL, J. D. LCdr. ..... NMCB Status Report
RUHRER, J. T. ..... Bargeships in Amphibious Logistics
SCHAAF, R. R. ..... Advanced Base Design Shared
SPECK, William ..... Environmental Impact Statements
SUITE, William C. ..... Leisure Center For Texas Air Station
TRIPPI, Frank T. ..... Active Duty Training Becomes Mutual Payoff
TYRRELL, J. V., P. E. ..... Building Codes vs Design Standards
WALL, S. J. ..... Transportation Equipment Management Revised
WHITE, C. G. ..... Ships Waste Offload System
UNSIGNED ..... Air Monitoring Van Deployed
UNSIGNED ..... East Coast RPG Operational
UNSIGNED ..... Navy Environmental Protection Data Base
UNSIGNED ..... Oil Spill Recovery tests in San Diego Harbor

Winter of 1973

AGNOS, John N. ..... Shore Power to the Fleet
ANGELELLI, R. P., Lt. ..... Seabee Rates Listed in DPPO Drive
BEARDEN, Norman C. ..... Inadequate Quarters Designations Reinstituted
CAVE, Patrick ..... High-Strength Electromechanical Cable
CONNER, D. L., Cdr. ..... Naval Construction Force Review
EVERHART, G. F., Lt. ..... Professional Registration Enhances CEC Officers' Careers
FITZGERALD, R. A., PE ..... Navy's Fuel Crisis/30-day Storage
GOODWIN, Richard S. ..... Nimitz Library Dedicated at Naval Academy
GRIFFITHS, W. B. ..... AICUZ — DOD's Pacification Program
HANNEMANN, D. M., PE ..... CAPSE — Power System Safeguard
HUGUELET, T. L., Lt. ..... Building a Nest for Navy's SES
JONES, Lyle ..... Construction Management Transitions in Vietnam
KIEFERLE, F. T. ..... Trends in Navy Yards and Drydocks
KRAUTER, G. E. ..... McMurdo Nuclear Power Plant Closed
LAMB, H. C. ..... NAVFAC Presents Energy Alternatives to AEC
LEWIS, R. D. ..... "Noisy Goat" Tests at San Clemente
MANGRUM, W. R., WO2 ..... Big Yellow Flush Truck
MAYER, Robert H., Jr., Ens ..... NAVFAC/UCT-1 Install Underwater Sensor System
NAVFAC Counsel Staff ..... Advice of Counsel — Fulfilling Contract Obligations
NIECE, W. Samuel, Lt. ..... Lifting Old Cranes Into Shape
OWEN, James W., II, Lt ..... NARF . . . Big Business in San Diego
SCHURR, T. P., Cdr ..... Multi-year Program System for Military Construction
VOLK, R. K., Jr. ..... Real Property Inventory Credibility
WELBORN, Omar, CUCM ..... Seabee Retention Study Group Advises CNO
WELLES, Richard H. ..... Performance Specification Defined
WELLES, Richard H. ..... Project Specification by Computer
WERNIGG, Lajos M. ..... Updating Sanitary Landfill Criteria
WERNIGG, Lajos M. ..... NAVFAC Pollution Control Standards Adjusted
WHITE, C. George ..... NAVFAC Pollution Control Standards Adjusted
UNSIGNED ..... CBC Davisville to Logistics Role Sans Seabees
UNSIGNED ..... CECOS Courses Offered, February-July 1974
UNSIGNED ..... Hydraulic Tools for Undersea Work
UNSIGNED ..... Portable Paint Identification Kit
UNSIGNED ..... PWC San Francisco Debut Slated

SECOND SECTION

General Features

AICUZ — DOD's Pacification Program ..... Winter p. 4
Air Installation Compatible Use Zones ..... Summer-p. 11
Azores Fixed Acoustic Range (AFAR) ..... Spring-p. 4
Building a Nest for Navy's SES ..... Winter-p. 24
Command Changes at CBC Gulfport ..... Summer-p. 14
Ens. Rigoulot Graduates from CECOS ..... Summer-p. 27
How to Brief — Briefly ..... Summer-p. 25
Instant Communication Formula ..... Spring-p. 23
Instant Housing Referrals ..... Fall-p. 23
Is It Time To Go — Underground? ..... Fall-p. 28
Livestock Grazing on Boardman Range ..... Summer-p. 22
Marine Borer Named for Laboratory ..... Spring-p. 26
Museum Solicits Mementos ..... Spring-p. 21
NARF . . . Big Business in San Diego ..... Winter-p. 28
NAVFAC Cost-Cutters Sheepish ..... Summer-p. 22
Navy/Marine Conservation Awards ..... Summer-p. 15
Nimitz Library Dedicated at Naval Academy ..... Winter-p. 8
Noisy Goat Tests at San Clemente ..... Winter-p. 6
Personal Pride Pays Off ..... Spring-p. 29
RPG Facility at Point Mugu ..... Spring-p. 21
Seabee Reserve Command Changes ..... Summer-p. 25
SouDiv Nets Navy's Largest Timber Sale ..... Summer-p. 21
TACOSS Prototypes Demonstrated ..... Summer-p. 16

Construction, Facility

Ammo Pier Delay in Guam ..... Spring-p. 21
East Coast RPG Operational ..... Fall-p. 23
Leisure Center For Texas Air Station ..... Fall-p. 21
Mediterranean Facilities Studies ..... Spring-p. 7
Modular BEQ's at Reindeer Station ..... Summer-p. 23
Navy Lodge Units Now in Use ..... Spring-p. 18
Prototype for Marine Corps BEQ ..... Summer-p. 15
Vehicle Storage Facility Opens ..... Summer-p. 20
WESTDIV Wins Design Awards ..... Spring-p. 13

Management

Advanced Base Design Shared ..... Fall-p. 19
Armed Forces Pest Control Board ..... Spring-p. 18
A Vanishing Breed ..... Spring-p. 28
CBC Davisville To Logistics Role Sans Seabees ..... Winter-p. 18
Construction Management Transitions in Vietnam ..... Winter-p. 13
Co-op Administrative Work Study Program ..... Summer-p. 26
Data Processing Trends ..... Fall-p. 18
Dredging Goes Environmental ..... Summer-p. 14
Economic Analysis Course ..... Spring-p. 28
Energy Resources Group Established ..... Summer-p. 20
Evaluating Medical Facility Construction ..... Summer-p. 19
FACSO Comes of Age ..... Spring-p. 22
Housing Management Information System ..... Summer-p. 19
Inadequate Quarters Designations Reinstituted ..... Winter-p. 22
Land Acquisition Policies ..... Spring-p. 19
LANTDIV's New European Branch ..... Spring-p. 22
Military Preference Housing ..... Spring-p. 20
Multi-year Program System for Military Construction ..... Winter-p. 23
NAVFAC Pollution Control Standards Adjusted ..... Winter-p. 19
Navy Environmental Protection Data Base ..... Fall-p. 26
Navy Houses Into Navy Homes ..... Fall-p. 16
PacDiv on Line With FACSO ..... Summer-p. 21
Performance Specification Defined ..... Winter-p. 19
Planning the Pollution Battle ..... Summer-p. 12
Project Specifications by Computer ..... Winter-p. 15
Radiological Affairs Support Program ..... Summer-p. 19
Real Property Inventory ..... Spring-p. 20
Real Property Inventory Credibility ..... Winter-p. 22
The Role of the Proponent in the NFS ..... Fall-p. 27
Transportation Equipment Management Revised ..... Fall-p. 21
Trends in Navy Yards and Drydocks ..... Winter-p. 18
Updating Sanitary Landfill Criteria ..... Winter-p. 19
Utilities Procurement ..... Spring-p. 19
Value Engineering Analysis ..... Spring-p. 22

Seabee Features

Gulfport Seabees Aid Tornado Recovery ..... Summer-p. 8
Mobile Reservists Build Self-Help Hobby Shop ..... Summer-p. 25
NMCB-1 Wins Peltier Award ..... Spring-p. 24
Reserve Readiness Advanced ..... Spring-p. 24
Seabees Aid Quake Cleanup ..... Spring-p. 24
Seabee Rates Listed in DPPO Drive ..... Winter-p. 20
Seabee Retention Study Group Advises CNO ..... Winter-p. 21

Seabee Operations

Challenge of Diego Garcia ..... Spring-p. 8
Naval Construction Force Review ..... Winter-p. 20
NAVFAC/UCT-1 Install Underwater Sensor System ..... Winter-p. 18
NMCB Status Report ..... Spring-p. 23
NMCB Status Report ..... Fall-p. 7
Seabee Retention Study Group Advises CNO ..... Winter-p. 21

Technical

Air Monitoring Van Deployed ..... Fall-p. 15
Bargeships In Amphibious Logistics ..... Fall-p. 10
Big Yellow Flush Truck ..... Winter-p. 14
Blast Effects on Fish ..... Spring-p. 25
Building Codes vs Design Standards ..... Fall-p. 20
CAPSE — Power System Safeguard ..... Winter-p. 10
Collection of Bilge Wastes ..... Spring-p. 14
Containerization of Ordnance ..... Spring-p. 13
Containership Offshore Offload Concepts ..... Spring-p. 10
Cryogenics Storage and Transfer Systems ..... Fall-p. 25
Developing a Cost/Benefits Model ..... Summer-p. 18
Disaster Mitigation Programs ..... Summer-p. 4
Earthquake Engineering Research ..... Summer-p. 6
Gambusia Fish Quell Mosquitos ..... Summer-p. 22
High-Strength Electromechanical Cable ..... Winter-p. 12
Hospital Wastes Handling System ..... Summer-p. 9
Hydraulic Tools for Undersea Work ..... Winter-p. 12
Hyperbaric Design Manual ..... Spring-p. 19
Key Entry System for FACSO ..... Spring p. 18
Lifting Old Cranes Into Shape ..... Winter-p. 16
McMurdo Nuclear Power Plant Closed ..... Winter-p. 7
NAVFAC Carpet Flammability Standards ..... Summer-p. 29
NAVFAC Presents Energy Alternatives to AEC ..... Winter-p. 9
Navy's Fuel Crisis/30-day Storage ..... Winter-p. 9
NCEL Tests Power Monitor ..... Spring-p. 25
Noise Study at Naval Underseas Center ..... Summer-p. 27
Non-destructive Pavement Tester Trials ..... Summer-p. 28
Oil Spill Recovery Tests in San Diego Harbor ..... Fall-p. 14
OSDOC II Exercises ..... Spring-p. 12
Pesticide Disposal ..... Fall-p. 22
Plastics Labeled Hazardous ..... Fall-p. 26
Portable Paint Identification Kit ..... Winter-p. 12
Project Manual For Cost Data ..... Spring-p. 15
RDT&E — Help in a Hurry ..... Spring-p. 25
Renewal of Pierside Electrical Services ..... Fall-p. 22
Ships Waste Offload System ..... Fall-p. 26
Shore Power to the Fleet ..... Winter-p. 11
Small Incinerator Technology ..... Fall-p. 8
Tri-Service Seismic Design Manual ..... Summer-p. 7
Uninterruptible Power Systems ..... Summer-p. 20
Utilities Energy Conservation Program ..... Fall-p. 4

Professional Development

Careers: Planned or Gambled? ..... Spring-p. 26
CEC Officers Postgraduate Program ..... Spring-p. 27
Professional Registration Enhances CEC Officers' Careers ..... Winter-p. 21
Profile of NAVFAC's Engineers and Scientists ..... Fall-p. 12
The CEC College Program ..... Spring-p. 29

Schools/Training

Active Duty Training Becomes Mutual Payoff ..... Fall-p. 24
CECOS Courses Offered, February-July 1974 ..... Winter-p. 26
Construction Training by Army Engineers ..... Fall-p. 24

Advice of Counsel

Fulfilling Contract Obligations ..... Winter-p. 26
Effects of Non-Compliance ..... Spring-p. 30
Environmental Impact Statements ..... Fall-p. 30
Government Procurement Commission ..... Summer-p. 30

Historical Events

Change of Command ..... Spring-p. 16
Preserving the Navy's Heritage ..... Summer-p. 29
PWC San Francisco Debut Slated ..... Winter-p. 23
Yards & Docks Annex ..... Spring-p. 30

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